North Carolina Department of Transportation
Statewide Planning Branch

Thoroughfare Plan for the Towns of Banner Elk & Beech Mountain

October, 2003

Towns of Banner Elk and Beech Mountain Thoroughfare Plan

Prepared by the:

Statewide Planning Branch
North Carolina Department of Transportation

In Cooperation With:

The Towns of Banner Elk and Beech Mountain
The Federal Highway Administration
U.S. Department Of Transportation

October, 2003

Travis K. Marshall, P.E.
Manager, Eastern Planning Group
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Acknowledgments

Persons responsible for this report:

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Eastern Planning Group Manager:	Travis K. Marshall, P.E.
Manager Statewide Planning Branch:	Mike Bruff, P.E.
Transportation Technicians:	Larry Toney

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EXECUTIVE SUMMARY

This plan documents the findings of a thoroughfare study for the Towns of Banner Elk and Beech Mountain. Recommendations for this study are shown in Figure 3 and listed below with a brief description. Projects included in the 2004-2010 Transportation Improvement Program (TIP) are shown in parenthesis. A more detailed discussion of these recommendations can be found in Chapter 2.

Major Thoroughfares

NC 184 Alternate

A two-lane facility on new location with limited control of access be constructed. In anticipation of future widening, right-of-way should be reserved for a multi-lane facility. The alternative will serve to relieve congestion on NC 184 (Shawneehaw Road) and provide easier access to the westside of town. The project will begin at NC 184, just north of SR 1341 (Banner Road) and terminate at NC 194 (Main Street) across from Hilldrop Way Road.

NC 184 Widening

NC 184 should be widened from a two-lane road to a multi-lane facility beginning at the southern Banner Elk Urban Planning Boundary (BEUPB) and extending north to NC 194. Currently, NC 184 from NC 105 to NC 194 is programmed to be upgraded on the unfunded list of the 2004-2010 Transportation Improvement Program (TIP).

NC 194 Widening

NC 194 should be widened from a two-lane road to a multi-lane facility beginning at NC 184 (Shawneehaw Road) to NC 184 (Beech Mountain Road). Currently, NC 194 is programmed to be upgraded on the unfunded list of the 2004-2010 Transportation Improvement Program (TIP).

Minor Thoroughfares

Eastside Connector

A two-lane facility on new location with limited control of access be constructed. The connector will provide an alternate for traffic traveling east. The project will begin at the new road behind Town Hall, cross SR 1337 (Dobbins Road), and terminate at NC 184.

NC 184 (Beech Mountain Road)

It is recommended that passing lanes, a turning lane, and additional shoulders be constructed on NC 184 (Beech Mountain Road). Two passing lanes would be constructed between NC 194 and the Banner Elk Urban Planning Boundary (BEUPB). The first passing lane would be southbound and approximately start 0.2 miles south of the Fox Run Community and end 0.2 miles north of Jacklopes Road. The second passing lane will begin 0.2 miles south of High South Lane and extend northbound until tying into the existing passing lane. The turning lane would be located at the northern (BEUPB) in

front of Ski Beech Resort. If possible, additional shoulder is recommended for two curves on Beech Mountain. The first curve is located between Tamarack and Tobogan Lane and the second curve is 0.035 miles north of Grey Fox Road and 0.025 miles south of Jacklopes Road.

Intersection Improvements

NC 184 and Dobbins Road

Realign the intersection of SR 1337 (Dobbins Road) and NC 184 further to the south to provide improved sight distance.

NC 194 and NC 184

Due to the large amount of traffic volumes entering the intersection and documented traffic accidents, it recommended that the intersection approach be widened to include an additional turning lane. The recommended improvements will result in increased capacity, less congestion, greater maneuverability, and safer driving conditions.

Chapter 1

Introduction

Overview

Officials of the Town of Banner Elk and Beech Mountain, prompted by a desire to adequately plan for the future transportation needs of Banner Elk and Beech Mountain, requested the North Carolina Department of Transportation's (NCDOT) assistance in conducting a thoroughfare plan study. The primary concern of the Banner Elk's Town Board and the Planning Board was the increased congestion along main thoroughfares, NC 184 and NC 194. Beech Mountain's Board is concerned with improving safety on NC 184 (Beech Mountain Road).

The objective of thoroughfare planning is to enable the transportation network to be progressively developed to adequately meet the transportation needs of a community or region as land develops and traffic volumes increase. By not planning now for our future transportation needs, unnecessary costs to the physical, social, and economic environment may very well be incurred. Thoroughfare planning is a tool that can be used by local officials to plan for future transportation needs, while at the same time reducing the costs to our environment.

The primary purpose of this report is to present the findings and recommendations of the thoroughfare plan study conducted for the Towns of Banner Elk and Beech Mountain. The secondary purpose of this report is to document the basic thoroughfare planning principles and procedures used in developing these recommendations. This report can be divided into five parts. The first part of the report, covered in Chapter 1, covers the highlights of the study. Chapter 2 and 3 provide a detailed description of the Thoroughfare Plan study recommendations and address different methods by which these recommendations can be implemented. The next chapter, Chapter 4, covers study procedures and findings. Chapter 5 and 6 provide a detailed description of population, land use and environmental concerns that were looked at while developing this plan. The final chapter, Chapter 7, covers traffic modeling development.

Information that will be especially useful to the practitioners is provided in the Appendix. The principles of thoroughfare planning are covered in Appendix A, a detailed tabulation of all routes on the Thoroughfare Plan and a graphical representation of typical cross-sections can be found in Appendix B and C respectively. Information related to subdivision ordinances is covered in Appendix D. Appendix E includes housing and employment data, while Appendix F has Pedestrian Guidelines. The last two appendices, G and H, include the Transportation Improvement Program Process and a Resources and Contacts Listing, respectively.

Background

The Towns of Banner Elk and Beech Mountain, located in western North Carolina, are small tourist communities found in the northern portion of Avery County and southwestern portion of Watauga County. Banner Elk and Beech Mountain located approximately 30 miles southwest of

Boone. The Towns are mostly residential, with very light industry, and concentrated commercial development along the major thoroughfares of NC 184 (Shawneehaw Avenue) and NC 194 (Main Street). Many of the houses in the area serve as vacation homes.

The North Carolina Department of Transportation and the Towns of Banner Elk and Beech Mountain are jointly responsible for the proposed thoroughfare improvements. Cooperation between the state and the towns is of primary concern if the recommendations outlined in Chapter 2 are to be successfully implemented. All parties, except the Town of Banner Elk, have mutually adopted the plan, and it is the responsibility of Beech Mountain to implement the plan following guidelines set forth in Chapter 3. The Town Beech Mountain adopted this plan on December 10, 2002, and the North Carolina Department of Transportation on February 6, 2003.

It is important to note that the recommended plan is based on anticipated growth within the planning area as indicated by past trends and future projections. Prior to construction of any of these projects, a more detailed study will be required to revisit development trends and to determine specific locations and design requirements.

GEOGRAPHIC LOCATION FOR BANNER ELK & BEECH MOUNTAIN NORTH CAROLINA

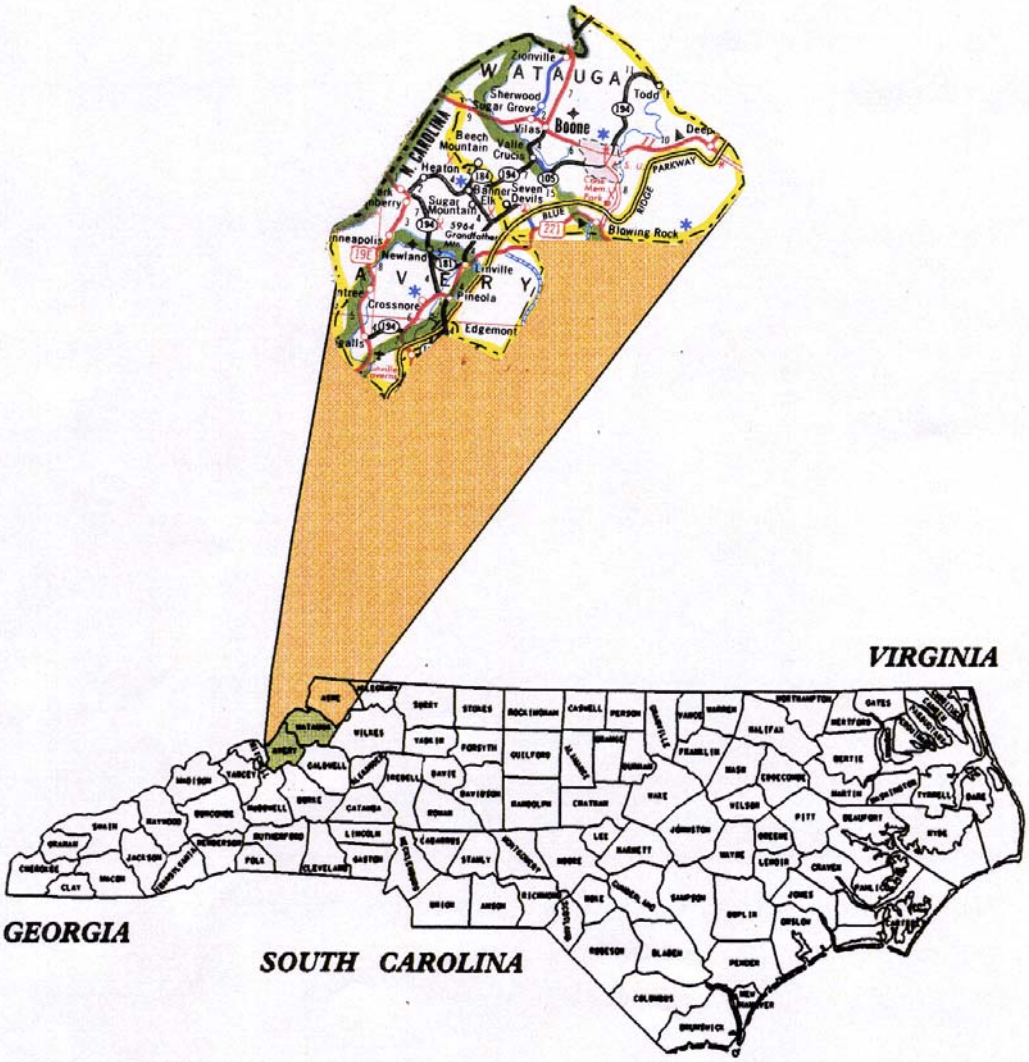


FIGURE 1

Chapter 2

Recommended Thoroughfare Plan

Intent of the Thoroughfare Plan

Transportation is the backbone of a regions economic vitality. Without an adequate transportation system people cannot easily reach their intended destination, goods cannot be delivered to the market in a cost effective manner, and investors may look to invest in better served areas. Recent trends such as regional economies, "just in time" delivery, increased automobile ownership, and increased migration away from the central cities and towns are taxing our existing transportation system and requiring that we put move emphasis on planning for our transportation future.

A thoroughfare plan study identifies existing and future deficiencies in the transportation system, as well as uncovers the need for new facilities (Please see Figure 2). The thoroughfare plan also provides a representation of the existing highway system by functional use. This use can be characterized as a part of the major or minor thoroughfares plus any new facilities that are needed. A full description of these various systems and their subsystems is given in Appendix A.

This chapter presents the thoroughfare plan recommendations (Please see Figure 3). It is the goal of this study that the recommended plan set forth a transportation system that will serve the anticipated traffic and land development needs for the Towns of Banner Elk and Beech Mountain. The primary objective of this plan is to reduce traffic congestion and improve safety by eliminating both existing and projected deficiencies in the thoroughfare system.

RECOMMENDATIONS

Major Thoroughfares
These are facilities that provide for the expeditious movement of high volumes of traffic within and through the urban area.

NC 184 Alternate

- **Project Recommendation:** It is recommended that a two-lane facility on new location with limited control of access be constructed. In anticipation of future widening, right-of-way should be reserved for a multi-lane facility. The alternative will serve to relieve congestion on NC 184 (Shawneehaw Road) and provide easier access to the westside of town. The project will begin at NC 184, just north of SR 1341 (Banner Road) and terminate at NC 194 (Main Street) across from Hilldrop Way Road.

- **Transportation Demand:** The NC 184 Alternate will serve to relieve traffic on NC 184 (Shawneehaw Road) and provide direct access to the westside of town. The alternate will primarily serve traffic traveling west on NC 194 from NC 184 and residents living west of Hilltop Way Road. The new facility will give local traffic better access to Lees McRae College and to the businesses located in the center of town.

- **Roadway Capacity and Deficiencies:** The 2000 average daily traffic (ADT) on NC 184, south of Dobbins Road (SR 1337), was between 7,800 and 10,000 vpd, while the northern section had an average ADT of 9,600 vpd. The base year ADTs already exceed the current design capacities on NC 184 and the projected 2025 volumes will lead to further deterioration of the major thoroughfare. The present level of service (LOS) on the facility is E and will continue to be at LOS E, unless improvements are made. The traffic volume on the proposed NC 184 Alternate is 5,100 vpd.

- **Safety Issues:** Several accidents at the intersection of NC 184 and NC 194 have been documented. Many of the accidents have been angle or rear end collisions. NC 184 carries 4% trucks, while NC 194 carries 3%. The NC 184 Alternate will allow trucks not destiny for the central part of the town to bypass the most congested area. The construction of this facility will decrease the traffic congestion, which will decrease the probability of accidents and decrease the number of trucks going through the town.

- **Social Demands and Economic Development:** The Town of Banner Elk is experiencing tremendous growth. The primary growth is contributed to residential construction. Both Beech Mountain and Banner Elk are resort towns that experience seasonal peaks in traffic volumes. Banner Elk also has Lees McRae College, which produces and attracts several trips. Although the 2-lane road is a limited controlled facility, new economic development will likely occur. To ensure that the integrity of the facility is kept, it has been suggested that the Town not allow sporadic development along the corridor, but limit the access as much as possible. If this doctrine is followed, the facility will move traffic efficiently, while also spurring economic development. Economic development will increase the tax base, which can be used to improve public services throughout Banner Elk.

- **System Linkage:** The Town of Banner Elk does not have an efficient roadway network as a result of terrain restraints. NC 184 is the only route that fully transverses the area north and south, while NC 194 is the only route traveling east and west. The lack of other north-south routes has caused the deterioration in the LOS on NC 184. This type of network forces all traffic traveling north or south onto NC 184. Banner Elk's roadway network also does not create good connectivity, nor allow for good maneuverability. However, the construction of the proposed facility will allow for an alternate north-south route.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

NC 184 Widening

- **Project Recommendation:** It is recommended that NC 184 be widened from a two-lane road to a multi-lane facility beginning at the southern Banner Elk Urban Planning Boundary (BEUPB) and extending north to NC 194 (Main Street). Currently, NC 184 from NC 105 to NC 194 is programmed to be upgraded on the unfunded list of the 2004-2010 Transportation Improvement Program (TIP) as R-2811.

- **Transportation Demand:** NC 184 is functionally classified as a rural collector. A rural collector serves sizable towns not directly served by the higher systems. These facilities service intracounty traffic generators. NC 184 runs centrally north-south through the Banner Elk / Beech Mountain planning area. NC 184 is the only route that traverses north or south out of the planning boundary. As a result the rural collector is heavily traveled by traffic traveling to Tennessee, Lees McRae College, Beech Mountain, and Banner Elk.

- **Roadway Capacity and Deficiencies:** The 2000 average daily traffic (ADT) on NC 184 (Shawneehaw Road) was between 7,800 and 10,000 vpd. The base year ADTs already exceed the design capacities on NC 184 and the projected 2025 will lead to further deterioration of the major thoroughfare. The 2025 traffic volumes range between 16,000 and 20,000 vpd. The present level of service (LOS) on the facility is E and will fall to LOS F, unless improvements are made.

- **Safety Issues:** Several accidents at the intersection of NC 184 and NC 194 have been documented. Many of the accidents have been angle or rear end collisions. NC 184 carries 4% trucks. However, the recommended improvements will result in increased capacity, less congestion, greater maneuverability, and safer driving conditions.

- **Social Demands and Economic Development:** There are many businesses located along the NC 184 corridor, particularly concentrated towards the center of the Central Business District (CBD). However, Banner Elk is also experiencing growth at the fringes of the CBD. The Town of Banner Elk also recently completed a streetscape plan. It is the desire of the Town that these types of plans will attract more tourists to the area. Although, it is quite obvious that more people will be choosing to live or vacation in Banner Elk as made apparent by the proposed residential construction. However, Banner Elk will not be able to accommodate citizens and visitors if an adequate transportation system is not in place to serve traffic demands.

- **System Linkage:** As a rural collector, NC 184 is a very important link in Banner Elk's roadway network. Over 50% of the roads in Banner Elk tie into NC 184, which is the only north-south route that carries traffic out of the Town. Therefore, all traffic traveling south or north of Banner Elk must load onto NC 184. It is apparent that NC 184 plays a crucial role in the movement of traffic and needs to be kept in good operational condition. As stated above, the NC 184 Alternate will allow for an additional north-south route. However, the alternate will not completely relieve the congestion on NC 184. Therefore, it is important not only to construct the alternate, but also to widen the existing facility.

- **Relationship to Other Plans:** NC 184 is scheduled for an upgrade under the unfunded Transportation Improvement Program (TIP) Project R-2811. The project extends from NC 105 to NC 194.

NC 194 Widening

- **Project Recommendation:** It is recommended that NC 194 (Main Street) be widened from a two-lane road to a multi-lane facility beginning at NC 184 (Shawneehaw Road) to NC 184 (Beech Mountain Road). Currently, NC 194 is programmed to be upgraded on the unfunded list of the 2004-2010 Transportation Improvement Program (TIP) as R-3604.

- **Transportation Demand:** NC 194 is functionally classified as a rural collector. A rural collector serves sizable towns not directly served by the higher systems. This facility services

intracounty traffic generators such as Lees McRae College. NC 194 runs centrally east-west through the Banner Elk / Beech Mountain planning area. NC 194 is the only route that travels east or west out of the planning boundary. As a result the rural collector is heavily traveled by traffic traveling to Tennessee, Lees McRae College, and Beech Mountain.

- **Roadway Capacity and Deficiencies:** The 2000 average daily traffic (ADT) on NC 194 was between 830 and 8,100 vpd. The base year ADTs already exceed the current design capacities from NC 184 (Shawneehaw Road) to NC 194 (Beech Mountain Road). The 2025 traffic volumes range between 1,000 and 15,000 vpd. The present level of service (LOS) on this section of the facility is E and will continue to be at LOS E, unless improvements are made.

- **Safety Issues:** Many trips are made in and out of the college. Widening of the facility will allow safer egress and ingress of the college. The recommended improvements will result in increased capacity, less congestion, greater maneuverability, and safer driving conditions.

- **Social Demands and Economic Development:** NC 194 is not as developed as NC 184, however the facility has various types of land uses abutting it. They include small business, Lees McRae College, a golfing community, and the Town Hall. NC 194 is also experiencing residential growth. However, Banner Elk will not be able to accommodate citizens and visitors if an adequate transportation system is not in place to serve traffic demands on NC 194.

- **System Linkage:** As a rural collector, NC 194 is a very important link in Banner Elk's roadway network. The facility is the only east-west route that carries traffic out of the Town. Therefore, all traffic traveling east or west of Banner Elk must use NC 194. It is apparent that NC 194 plays a crucial role in the movement of traffic and needs to be kept in good operational condition.

- **Relationship to Other Plans:** NC 194 is scheduled for an upgrade under the unfunded Transportation Improvement Program Project R-3604. The project extends from NC 184 (Shawneehaw Road) to NC 184 (Beech Mountain Road).

Minor Thoroughfares

These facilities collect traffic from local access streets and carry it to the major thoroughfares.

<u>Eastside Connector</u>

- **Project Recommendation:** It is recommended that a two-lane facility on new location with limited control of access be constructed. The connector will provide an alternate for traffic traveling east. The project will begin at the new road behind Town Hall, cross SR 1337 (Dobbins Road), and terminate at NC 184.

- **Transportation Demand:** The Eastside Connector will serve to relieve traffic on NC 184 (Shawneehaw Road) and provide direct access to the eastside of town. The connector will primarily serve local traffic traveling to the eastside of town. A small percentage of through traffic will use this new facility. The new connector will reduce traffic volumes on NC 184, allowing local traffic better access to Lees McRae College and businesses located in the center of town.

- **Roadway Capacity and Deficiencies:** The 2000 average daily traffic (ADT) on NC 184 between Banner Road and NC 194 was 9,400 vpd. In the future year, 2025, the ADT ranged between 18,000 and 19,000 vpd. The base year ADTs already exceed the design capacities. The connector will carry approximately 2,500 vpd. The present level of service (LOS) on this section of NC 184 is E and will fall to LOS F, unless improvements are made. The connector in combination with other recommendations will reduce congestion on NC 184.

- **Safety Issues:** Several accidents at the intersection of NC 184 and NC 194 have been documented. Many of the accidents have been angle or rear end collisions. The Eastside Connector will allow traffic not destiny for the central part of the Town to bypass the most congested area. The construction of the facility will decrease the traffic congestion, decreasing the possibility for accidents.

- **Social Demands and Economic Development:** The Town of Banner Elk is experiencing tremendous growth. The primary growth is contributed to residential construction. Residential construction is beginning to flourish on the eastern side of the Town. To ensure that the integrity of the facility is kept, it has been suggested that the Town not allow sporadic development along the corridor, but limit the access. If this doctrine is followed, the facility will move traffic efficiently, while also spurring economic development. Economic development will increase the tax base, which can be used to improve public services throughout Banner Elk.

- **System Linkage:** The Town of Banner Elk does not have an efficient roadway network as a result of terrain constraints. NC 184 is the only route that fully transverses the area north and south, while NC 194 is the only route traveling east and west. On the eastside of Banner Elk, there are very few cross-town connectors linked to NC 184. Banner Elk's roadway network does not create good connectivity, nor allow for good maneuverability. However, the construction of the proposed facility will allow for an alternate east-west route and improved connectivity.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

NC 184 (Beech Mountain Road)

- **Project Recommendation:** It is recommended that passing lanes, a turning lane, and additional shoulders be constructed on NC 184 (Beech Mountain Road). Two passing lanes would be constructed between NC 194 (Main Street) and the Banner Elk Urban Planning Boundary (BEUPB). The first passing lane would be southbound and approximately start 0.2 miles south of the Fox Run Community and end 0.2 miles north of Jacklopes Road. The second passing lane will begin 0.2 miles south of High South Lane and extend northbound until tying into the existing passing lane. The turning lane would be located at the northern (BEUPB) in front of Ski Beech Resort. If possible, additional shoulder is recommended for two curves on Beech Mountain. The first curve is located between Tamarack and Tobogan Lane and the second curve is 0.035 miles north of Grey Fox Road and 0.025 miles south of Jacklopes Road.

- **Transportation Demand:** Beech Mountain Road is the primary route to access Beech Mountain. The facility is the only route that travels north and south out of the planning boundary. As the primary route, the facility is used not only by local traffic, but also by tourist, as well as truck traffic.

- **Roadway Capacity and Deficiencies:** The 2000 average daily traffic (ADT) on NC 184 (Beech Mountain Road) was between 2,000 and 2,300 vpd. The 2025 traffic volumes range between 3,300 and 4,100 vpd. The capacity on the facility ranges between 5,300 and 7,300 vpd.

- **Safety Issues:** The facility is the main route to Beech Mountain and is very curvy and steep and at times very foggy. These types of conditions make it difficult for vehicles and tourists to travel at the posted speed. Therefore, the addition of passing lanes and a turning lane will result in increased capacity, greater maneuverability, and safer driving conditions.

- **Social Demands and Economic Development:** The Towns of Banner Elk and Beech Mountain are experiencing tremendous growth and are also major tourist attractions, which result in seasonal peaks in traffic volumes. Theses two factors support the need for passing lanes and a turning lane. The passing lanes will allow safe movement around trucks carrying heavy loads to construction sites located on Beech Mountain or slow moving vehicles. The turning lane will allow the continuos flow of traffic and may result in fewer accidents. The additional shoulders would provide extra pavement to maneuver around the tight curves.

- **System Linkage:** NC 184 (Beech Mountain Road) is a very important link in Beech Mountain's roadway network. The facility is the only north-south route that carries traffic in and out of the Town. Therefore, all traffic traveling north-south of Beech Mountain must load onto NC 184. It is apparent that NC 184 plays a crucial role in the movement of traffic in Beech Mountain and needs to be kept in good operating condition.

- **Relationship to Other Plans:** This facility is not directly connected to any other thoroughfare plan.

Intersection Improvements

The following intersections are recommended for safety improvements.

- **NC 184 and SR 1337 (Dobbins Road):** It is recommended to realign the intersection of Dobbins Road and NC 184 further to the south to provide improved sight distance.

- **NC 194 and NC 184:** Due to the large amount of traffic volumes entering the intersection and documented traffic accidents, it recommended that the intersection approach be widened to include an additional turning lane. The recommended improvements will result in increased capacity, less congestion, greater maneuverability, and safer driving conditions.

Bicycle Routes

According to the NCDOT Bicycle and Pedestrian Division, the Banner Elk / Beech Mountain planning area does not have any bicycle routes. However, if either Town does decide to designate a facility as a bicycle route, please contact the Division of Bicycle and Pedestrian Transportation for assistance. Also, before roadways designated as bicycle routes are widened, the NCDOT Division of Bicycle and Pedestrian Transportation should be consulted. This division can recommend the most appropriate cross section for the widening, in addition to providing assistance in identifying the need for improvements based on present and future bicycle traffic. For further consideration and assistance, the coordinator of this division can be contacted at the address below.

NC Department of Transportation
Division of Bicycle and Pedestrian Transportation
1552 Mail Service Center
Raleigh, NC 27699-1552

Public Involvement

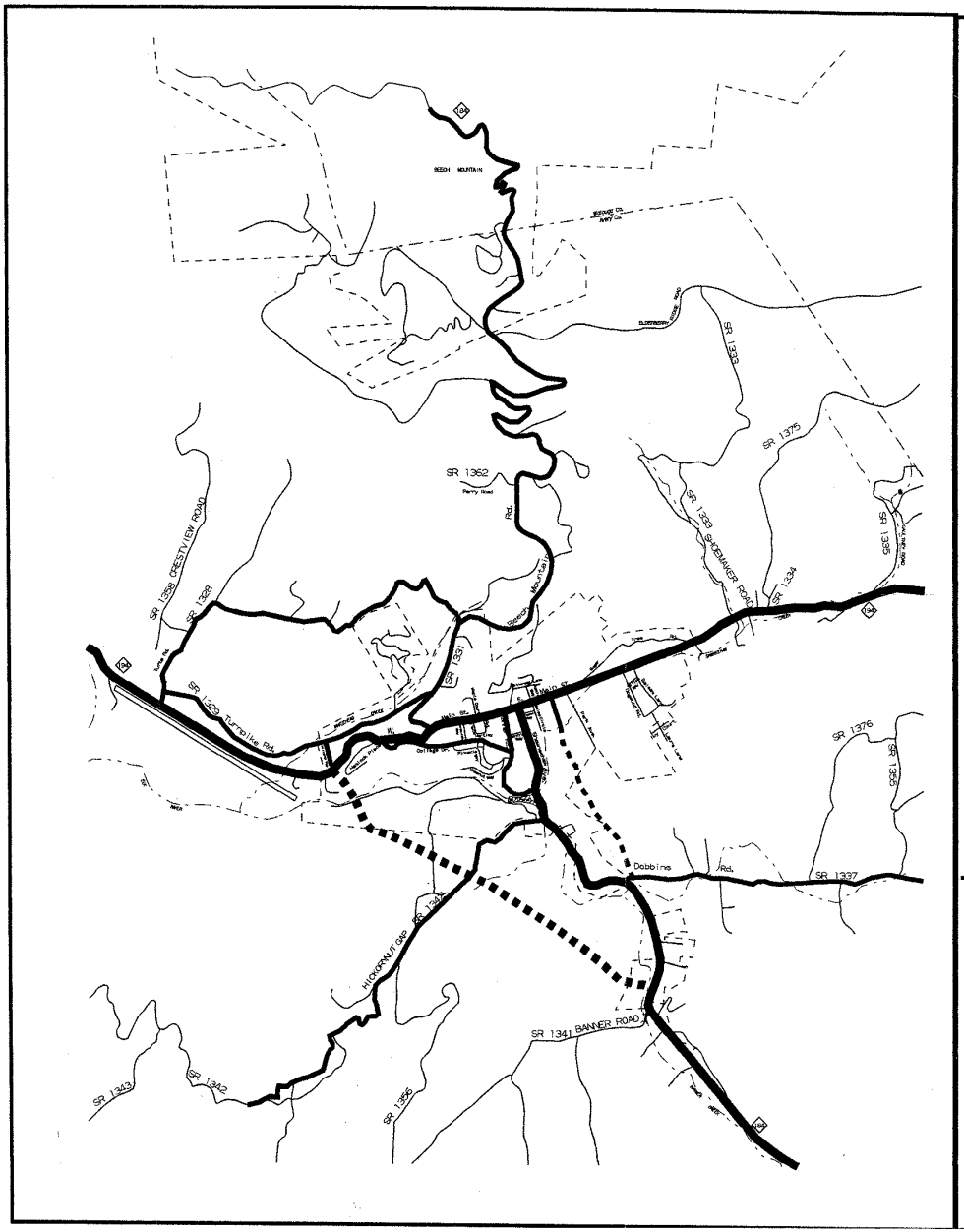
Based on a request from the Town of Banner Elk on May 12, 1999, a study to update the thoroughfare plan for Banner Elk / Beech Mountain was officially started in July of 1999. NCDOT officials met with the Banner Elk Planning Board October 4,1999 to present information on the thoroughfare planning process and to gather input on the transportation needs of the town. On November 9, 2000, NCDOT representatives and Banner Elk Planning Board met to develop socioeconomic data projections to be used to estimate traffic conditions over the twenty-five year planning period. NCDOT and Banner Elk and Beech Mountain officials met again on April 2, 2001 to discuss preliminary recommendations for the thoroughfare plan.

The citizens of Banner Elk have very strong feelings about R-2811, which recommends the widening of NC 184 from NC 105 to NC 194. Their concerns are centered on the impact the widening would have on the atmosphere and business located in the center of Town. The Town believes the widening would cause the businesses to close, which would adversely affect their economy. The Town has also approved a Streetscape Plan, which includes the installation of greenways, sidewalks, benches, streetlights, and shrubs in four phases. This is in an effort to make the Town a more walkable community. However, the Town does realize that it is growing and will need to provide adequate infrastructure to serve the citizens and tourists.

In realizing this, Mayor Deka Tate appointed a Transportation Task Force Committee. The committee included people from the planning board, Lees McRae College, Grandfather's Children's Home, and citizens from the community. The committee was instructed to work together with the Statewide Planning Engineer to come up with an alternative to widening NC 184

and NC 194. The committee had three sessions and presented their findings to the planning board on May 6, 2002. Their recommendations may be found in Figure 4 and Figure 5 is the response from the Statewide Planning Engineer to questions that were raised during one of the Task Force's committee meetings.

On August 13, 2002 a public drop-in-session was held, where information on the proposed thoroughfare plan was distributed and NCDOT representatives were available to discuss the recommendations. The proposed thoroughfare plan was presented at the November 12, 2002, Banner Elk Town Council Meeting, with members of the public present. After a public hearing, the Town Council chose not to adopted the Banner Elk / Beech Mountain Thoroughfare Plan. The council did not feel comfortable with the recommendations to widen NC 184 and NC 194 and believe that such actions will wipe out the Town's commercial businesses and destroy the village atmosphere. The Town decided to keep the existing 1985 Banner Elk Thoroughfare Plan. The Town of Beech Mountain did adopt their portion of the plan on December 10, 2002. The North Carolina Board of Transportation on February 6, 2003 adopted the thoroughfare plan.



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE	▬▬	▬ ▬ ▬
MINOR THOROUGHFARE	▬▬	▬ ▬ ▬
GRADE SEPERATION	○	○
INTERCHANGE	●	●

ADOPTED BY:

BANNER ELK
BEECH MOUNTAIN — December 10, 2002

RECOMMENDED BY:
STATEWIDE PLANNING BRANCH — November 12, 2002
N.C. DEPARTMENT OF TRANSPORTATION — February 6, 2003

N

S

NOVEMBER 12, 2002

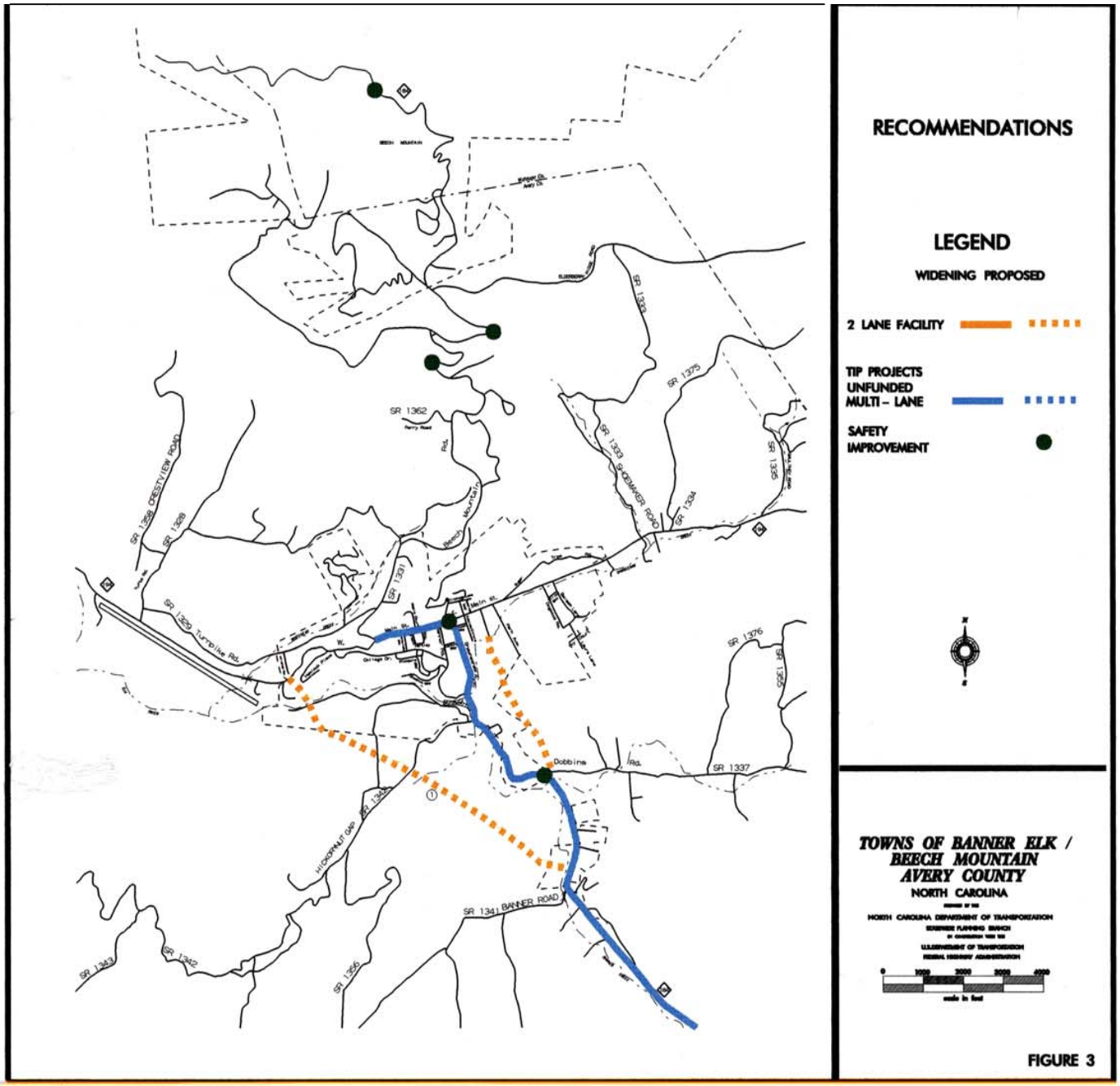
THOROUGHFARE PLAN

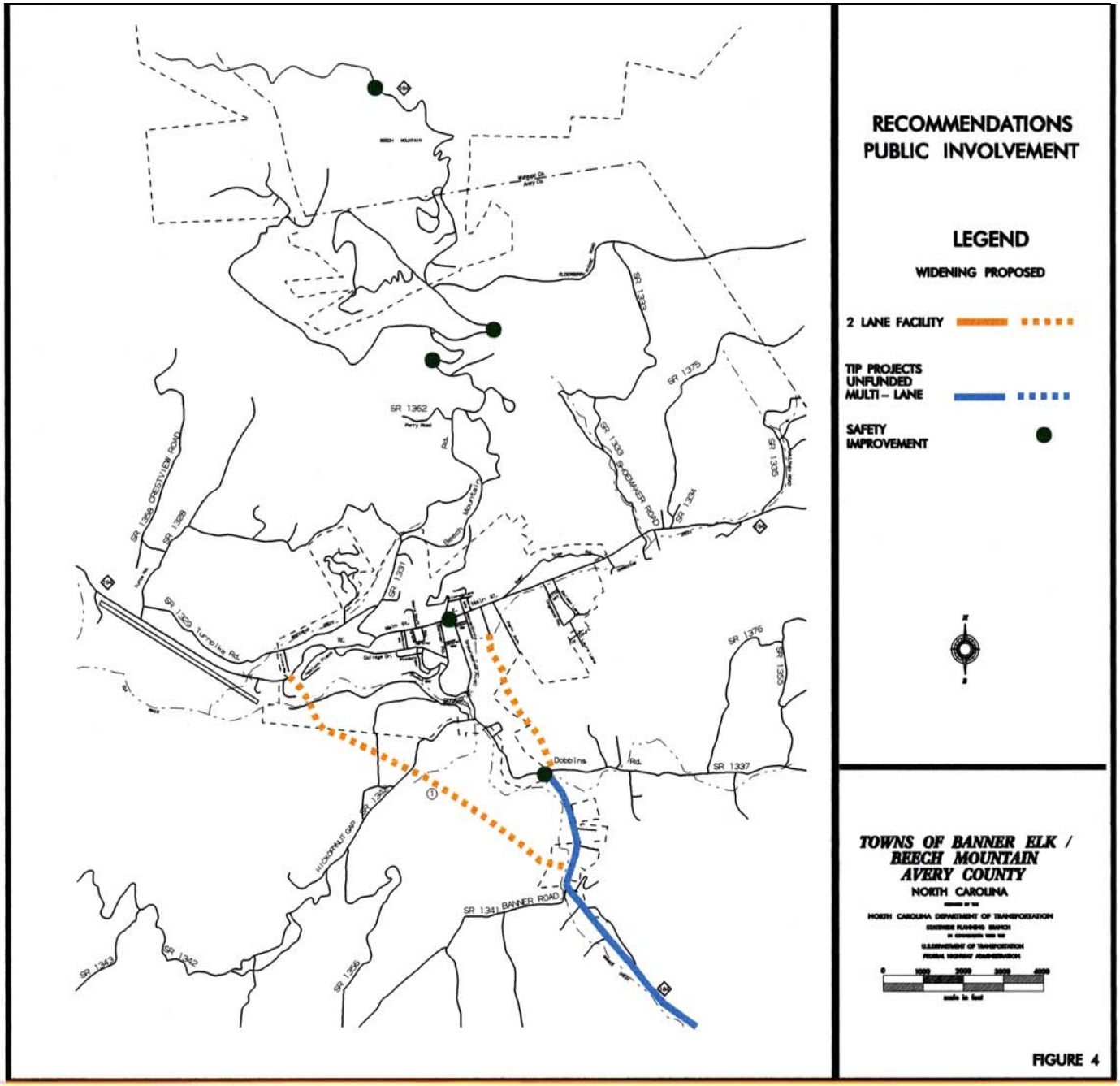
TOWNS OF BANNER ELK / BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1000 2000 3000 4000
scale in feet

FIGURE 2


RECOMMENDATIONS
LEGEND
WIDENING PROPOSED
2 LANE FACILITY
TIP PROJECTS
UNFUNDED
MULTI - LANE
SAFETY
IMPROVEMENT
SR 1362
SR 1339 CRESTVIEW ROAD
SR 1328
SR 1329 Turnpike Rd.
SR 1331
SR 1332
SR 1333 GOODMAKER ROAD
SR 1334
SR 1335
SR 1375
SR 1376
SR 1355
SR 1337
Dobbins Rd.
SR 1340
SR 1341 BANNER ROAD
SR 1343
SR 1342
SR 1356
TOWNS OF BANNER ELK / BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
FIGURE 3


RECOMMENDATIONS
PUBLIC INVOLVEMENT
LEGEND
WIDENING PROPOSED
2 LANE FACILITY
TIP PROJECTS
UNFUNDED
MULTI – LANE
SAFETY
IMPROVEMENT
SR 1362
SR 1333
SR 1375
SR 1333 GOODAWAY ROAD
SR 1334
SR 1335
SR 1358 CRESTVIEW ROAD
SR 1328
SR 1331
SR 1309 Turnpike Rd.
Main St.
SR 1376
SR 1325
Dobbins
Rd.
SR 1337
SR 1340
HICKORY NUT GAP
SR 1341 BANNER ROAD
SR 1343
SR 1342
SR 1356
TOWNS OF BANNER ELK /
BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
U.S.DEPARTMENT OF TRANSPORTATION
FIGURE 4

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

1554 MAIL SERVICE CENTER, RALEIGH, N.C. 27699-1554

LYNDO TIPPETT
SECRETARY

February 11, 2002

Mr. Bill Cook, Town Manager
Town of Banner Elk
P.O. Box 2217
Banner Elk, NC 28604

Subject: Banner Elk Thoroughfare Committee Response

Dear Mr. Cook:

I will not be able to attend the meeting on February 12th, but I have answered all of the committee's questions below.

1. Can the DOT be more specific on where the Western or Eastern Connector would be situated?
   The line drawn on the map only represents a general corridor and will not be specified until the project becomes funded. Once the project becomes funded, the Project Development and Environmental Analysis Branch would investigate specific alignments.

2. If NC 184 is widened, could DOT have or require the utilities be put underground?
   If design standards are met, the Department could have the utilities put underground, however the Town would be responsible for paying the difference in cost of just moving utilities versus laying them underground.

3. What would the multi-lane look like (i.e., curb and gutter, required right-of-way)?
   I have attached various cross-sections to give you a general sense of how it would look. Cross section G is a four lane facility with curb and gutter and sidewalks and requires 70 foot of right of way.

4. Would DOT replace the streetscape (i.e., brick sidewalks) and would be responsible for maintaining the sidewalks?
   Yes, the Department would put back in place what was existing before, but the Town would be responsible for maintenance of the sidewalks.

Figure 5

5. Would the multilane facility affect the natural gas line?
   This question would be more specifically answered once a specific design was chosen. If the lines need to be moved the cost would be included in the construction of the highway.

6. Could there be a greenway in conjunction with the Western or Eastern Connector?
   Yes, this could be included in the Town's Thoroughfare plan. The Bike and Pedestrian Branch would work the Town in developing and getting funding for the greenway.

7. Is it feasible to create a one-way pair using NC 184 as northbound lanes from Banner Road to NC 194 and using Banner Road as southbound lanes from NC 194 to NC 184?
   It may be feasible to create a one-way pair, however the pair may need to start further in Town. This is an alternative we can talk more about when you have your next meeting

8. How long has R-2811 and R-3604 been on the unfunded list? And if the Town was allowed to have R-2811 removed would we be able to put the western alternative in its place?

   R-2811 has been on the unfunded list since 1991 and R-3604 has been on list since 1996. The Town would be required to lobby for the Western alternative even if the R-2811 was removed.

I believe I have answered all of the current questions. Please contact me by phone, (919) 733-4705 or email, lydiamckoy@dot.state.nc.us if additional information is needed.

Sincerely,

Lydia McKoy

Lydia McKoy
Transportation Engineer
Statewide Planning Branch

Attachments(2)
Cc: Mr. Travis K. Marshall, P.E., Small Urban Unit

Chapter 3

Implementation of the Thoroughfare Plan

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of the transportation plan. Unless implementation is an integral part of this process, the effort and expense associated with developing the plan is lost. There are several tools available for use by the Towns of Banner Elk and Beech Mountain to assist in the implementation of the thoroughfare plan. They are described in detail in this Chapter.

State-Municipal Adoption of the Thoroughfare Plan

The Town of Beech Mountain and the North Carolina Department of Transportation have mutually approved the thoroughfare plan shown in Figure 2. This mutually approved plan serves as a guide for the Department of Transportation in the development of the road and highway system for Beech Mountain. The approval of the plan by the Town enables standard road regulations and land use controls to be used effectively in the implementation of this plan. As part of the plan, the Town and Department of Transportation shall reach agreement on the responsibilities for existing and proposed streets and highways. Facilities, which are designated as State responsibility will be constructed and maintained by the Division of Highways. Facilities, which are designated as municipal responsibility will be constructed and maintained by the municipality.

Methods Used to Protect the Adopted Thoroughfare Plan

Subdivision Controls

Subdivision regulations require every subdivider to submit to the Town Planning Board a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to reserve or protect necessary right-of-way for projected roads and highways that are to become a part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix D outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking.

Development Reviews

Development access to a state-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Planning Development and Environmental Analysis Branch, and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.

Zoning Ordinances

A zoning ordinance can be beneficial to thoroughfare planning by designating appropriate locations of various land use and allowable densities of residential development. This provides a degree of stability on which to make future traffic projections and to plan streets and highways. Other benefits of good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares and (2) the minimization of strip commercial development which creates traffic friction and increases the traffic accident potential.

Future Street Line Ordinances

A municipality with legislative approval may amend its charter to be empowered to adopt future street line ordinances. This ordinance, enacted for selected streets, is particularly beneficial for planned future improvements, such as roadway widening. Through a metes-and-bounds description of a street's future right of way requirements, the municipality may prohibit new construction or reconstruction of structures within the future right of way. This approach requires specific design hearings to be held as an opportunity for affected property owners to obtain information about what to expect and to make necessary adjustments without undue hardship.

Roadway Corridor Official Maps

A Roadway Corridor Official Map (Official Map) is a document adopted by the North Carolina Board of Transportation which allows the reservation of roadway corridors as provided by General Statutes 136-44.53. Official Maps place temporary restrictions on private property rights by prohibiting the issuance of a building permit or the approval of subdivision on property within an adopted alignment, for up to a three-year period beginning when a request for development is denied. The Official Map in effect serves as notice to developers that the state or municipality intends to acquire specific property. This process is a beneficial tool in directing development so those sites can be reserved for public improvements in anticipation of actual need.

Funding Sources

Capital Improvements Program

A capital improvement program makes it easier to build a planned thoroughfare system. A capital improvement program consists of two lists of projects. One list is to be funded and implemented fully by the municipality and the other list designated state responsibility is to be funded through the Transportation Improvement Program (TIP). These lists must be constrained by available or anticipated funding over the specified time frame.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is a document, which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Ever two years when the TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During biennial TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member reviews all of the project requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an Industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

Small Urban Funds

Small Urban funds are annual discretionary funds made available to municipalities with qualifying projects. The maximum amount is $1,000,000 per year per division. A city/town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the 3,600 miles of four lane construction on the North Carolina Intrastate System.

2. To construct a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.

3. To supplement the secondary roads appropriation in order to pave miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.

4. To supplement the Powell Bill Program, which provides funding for improving municipal streets.

5. To widen and improve 113 miles of existing interstate highways.

Over the twenty-five year planning period, the Towns of Banner Elk and Beech Mountain should look forward to the paving of most, if not all, of its unpaved roads on the State maintained system. For more information on the Highway Trust Fund Law, contact the Program Development Branch of the North Carolina Department of Transportation.

Implementation Recommendations

The following table provides a break down of the projects recommended in the Banner Elk and Beech Mountain Thoroughfare Plan and the corresponding funding that would best suit the implementation of the given project.

Table 1

Funding Sources and Recommended Methods of Implementation

Projects	Funding Sources				Methods of Implementation				
	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Develop. Review
NC 184 Alternate		X			X	X	X		X
NC 184 Widening		X			X		X		X
NC 194 Widening		X			X		X		X
Eastside Connector	X			X	X	X	X	X	X
NC 184 (Beech Mountain Rd.)	X	X		X	X				

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The potential cost estimate of four Banner Elk and Beech Mountain projects and the probabilities that economic development will be stimulated and environmental impact will be minimized are given in Table 3. A guide to this table is shown in Table 2.

Table 2

Probability Estimation Guide

Subjective Evaluation	Impact Probability
Excellent - very substantial	1.00
Very good - substantial	0.75
Good - considerable	0.50
Fair - some	0.25
Poor - none	0.00

Reduce road user cost should result from any roadway improvement, from a simple widening to the construction of a new roadway. Roadway improvements should also relieve congested or unsafe conditions.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (representing no development potential) to 1.00 (representing excellent development potential).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. Below are listed the thirteen items that are considered when evaluating the impacts on the environment

* air quality
* water resources
* soils and geology
* wildlife
* vegetation
* neighborhoods noise
* noise
* educational facilities
* churches
* parks and recreational facilities
* historic sites and landmarks
* public health and safety
* aesthetics

The environmental impact analysis also uses a probability rating from 0 (representing no benefit to the environment) to 1.00 (representing a positive impact to the environment.) A negative value is assigned to the probability to indicate a negative impact. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impacts of a project. Table shows the probability scale used in the analysis. This table can be used as a guideline for interpreting the “Economic Development” and Environmental Impact” values given in Table 3.

Table 3

Impact Evaluation for Major Projects

Projects	Costs (millions)	Length mi.	Economic Development	Environmental Impact
NC 184 Alternative	4.0	1.63	1.00	1.50
NC 184 Widening	6.5	1.27	0.25	0.75
NC 194 Widening	3.2	0.35	0.00	2.00
Eastside Connector	2.2	0.70	1.00	1.50

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs estimated in this report are based on the average statewide construction costs for similar project types. The anticipated right-of-way costs is also included as an average cost per acre for property throughout the Banner Elk and Beech Mountain Planning Area according to the respective project. Table 4 provides a break down of total project cost into construction cost and right-of-way cost for the major project proposals for the Thoroughfare Plan.

Table 4

Potential Project Cost Estimates for Major Projects

Project Description	Construction Cost (mill)	Right-of-way Cost (mill)	Total Cost (mill)
NC 184 Alternative	3.8	0.2	4.0
NC 184 Widening	2.6	3.9	6.5
NC 194 Widening	1.3	1.9	3.2
Eastside Connector	2.1	0.1	2.2

Chapter 4

Analysis of Banner Elk's and Beech Mountain's Roadway System

This chapter presents an analysis of the ability of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but also on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Travel Patterns

An analysis of the roadway system includes first looking at existing travel patterns and identifying existing deficiencies. This includes roadway capacity and safety analysis. Also in an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, access control, width of pavement, and the traffic control devices (such as signals) utilized.

After the existing picture of travel in the area has been developed, the engineer must analyze factors that will impact the future system. These factors include forecasted population growth, economic development potential, and land use trends. This information will be used to determine future deficiencies in the transportation system.

Capacity Analysis of the Existing System

An indication of the adequacy of the existing street system is a comparison of traffic volumes versus the ability of the streets to move traffic freely at a desirable speed. Primarily the spacing of major devices utilized controls the ability of a street to move traffic freely, safely, and efficiently with a minimum delay. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering strategies.

Capacity is the maximum number of vehicles which has a "reasonable expectation" of passing over a given section of a roadway, during a given time period under prevailing roadway and traffic conditions. The relationship of traffic volumes to the capacity of the roadway will determine the level of service (LOS) being provided. Six levels of service have been selected for analysis purposes. They are given letter designations from A to F with LOS A representing the best operating conditions and LOS F the worst.

The six levels of service are illustrated in Figure 6, and they are defined on the following pages. The definitions are general and conceptual in nature, but may be applied to urban arterial levels of service. Levels of service for interrupted flow facilities vary widely in terms of both the user's perception of service quality and the operational variables used to describe them. The 1997 Highway Capacity Manual contains more detailed descriptions of the levels of service as defined for each facility type.

Level of Service

LOS A

Describes primarily free flow conditions. The motorist experiences a high level of physical and psychological comfort. The effects of minor incidents of breakdown are easily absorbed. Even at the maximum density, the average spacing between vehicles is about 528 ft, or 26 car lengths.

LOS B

Represents reasonably free flow conditions. The ability to maneuver within the traffic stream is only slightly restricted. The lowest average spacing between vehicles is about 330 ft, or 18 car lengths.

LOS C

Provides for stable operations, but flows approach the range in which small increases will cause substantial deterioration in service. Freedom to maneuver is noticeably restricted. Minor incidents may still be absorbed, but the local decline in service will be great. Queues may be expected to form behind any significant blockage. Minimum average spacings are in the range of 220 ft, or 11 car lengths.

LOS D

Borders on unstable flow. Density begins to deteriorate somewhat more quickly with increasing flow. Small increases in flow can cause substantial deterioration in service. Freedom to maneuver is severely limited, and the driver experiences drastically reduced comfort levels. Minor incidents can be expected to create substantial queuing. At the limit, vehicles are spaced at about 165 ft, or nine car lengths.

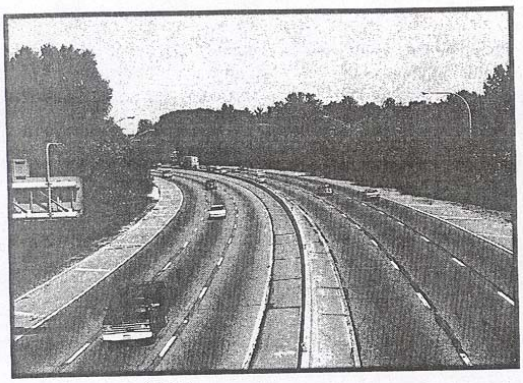
LOS E

Describes operation at capacity. Operations at this level are extremely unstable, because there are virtually no usable gaps in the traffic stream. Any disruption to the traffic stream, such as a vehicle entering from a ramp, or changing lanes, requires the following vehicles to give way to admit the vehicle. This can establishes a disruption wave that propagates through the upstream traffic flow. At capacity, the traffic stream has no ability to dissipate any disruption. Any incident can be expected to produce a serious breakdown with extensive queuing. Vehicles are spaced at approximately six car lengths, leaving little room to maneuver.

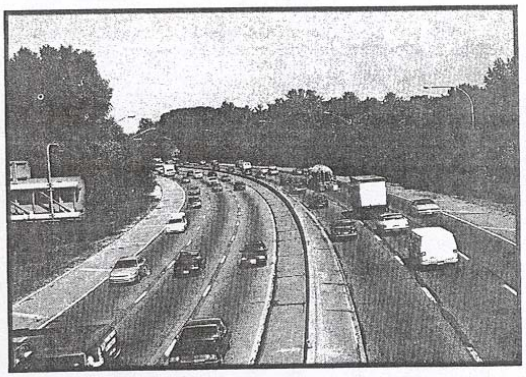
LOS F

Describes forced or breakdown flow. Such conditions generally exist within queues forming behind breakdown points.

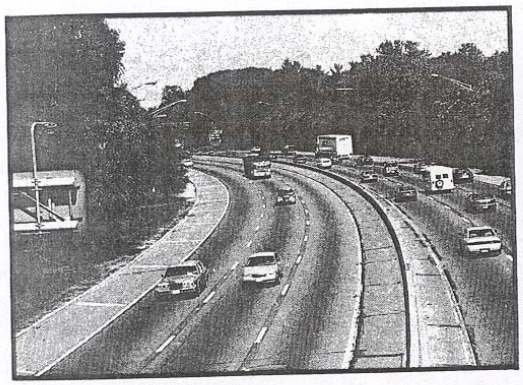
Source: 1994 Highway Capacity Manual



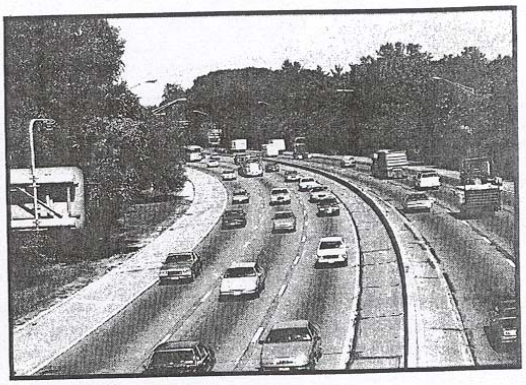
LOS A.



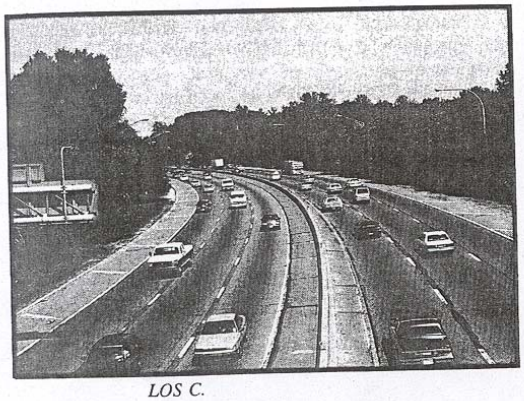
LOS D.



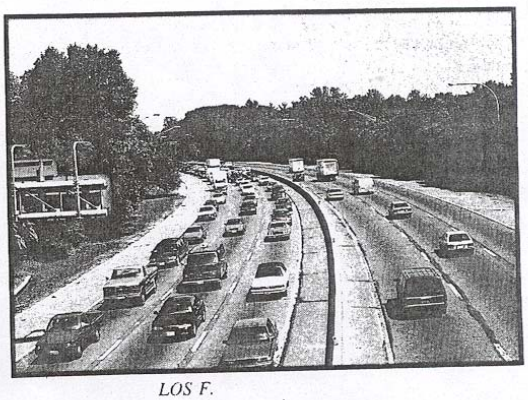
LOS B.



LOS E.



LOS C.



LOS F.

LEVELS OF SERVICE **Figure 6**

Traffic Crashes

Traffic crashes are often used as an indicator for locating congestion problems. Traffic crash records can also be reviewed to identify problem locations or deficiencies such as poor design, inadequate signing, ineffective parking, or poor sight distance. Crash patterns developed from analysis of crash data can lead to improvements that will reduce the number of crashes.

Table 5 is a summary of the crashes occurring in Banner Elk between January 1995 and 1998. This table only includes locations with 10 or more crashes. The "Total" column indicates the total number of crashes reported within 200 ft (61.0 m) of the intersection during the study period indicated. The severity listed is the average crash severity for that location.

Table 5

Location with 10 or More Crashes in a 3-Year Period

Locations	Angle	Rear End	Ran Off Road	Left Turn	Right Turn	Other	Total	Severity
NC 184/NC 194	4	5	1	2	3	4	20	5.53

Both the severity and number of crashes should be considered when investigating crash data. The severity of every crash is measured with a series of weighting factors developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating crash is 47.7 times more severe than one involving only property damage, and an crash resulting in minor injury is 11.8 times more severe than one with only property damage. To request a more detailed crash analysis for any of the above mentioned intersections, or other intersection of concern, the Town should contact the Traffic Engineer in Division 11.

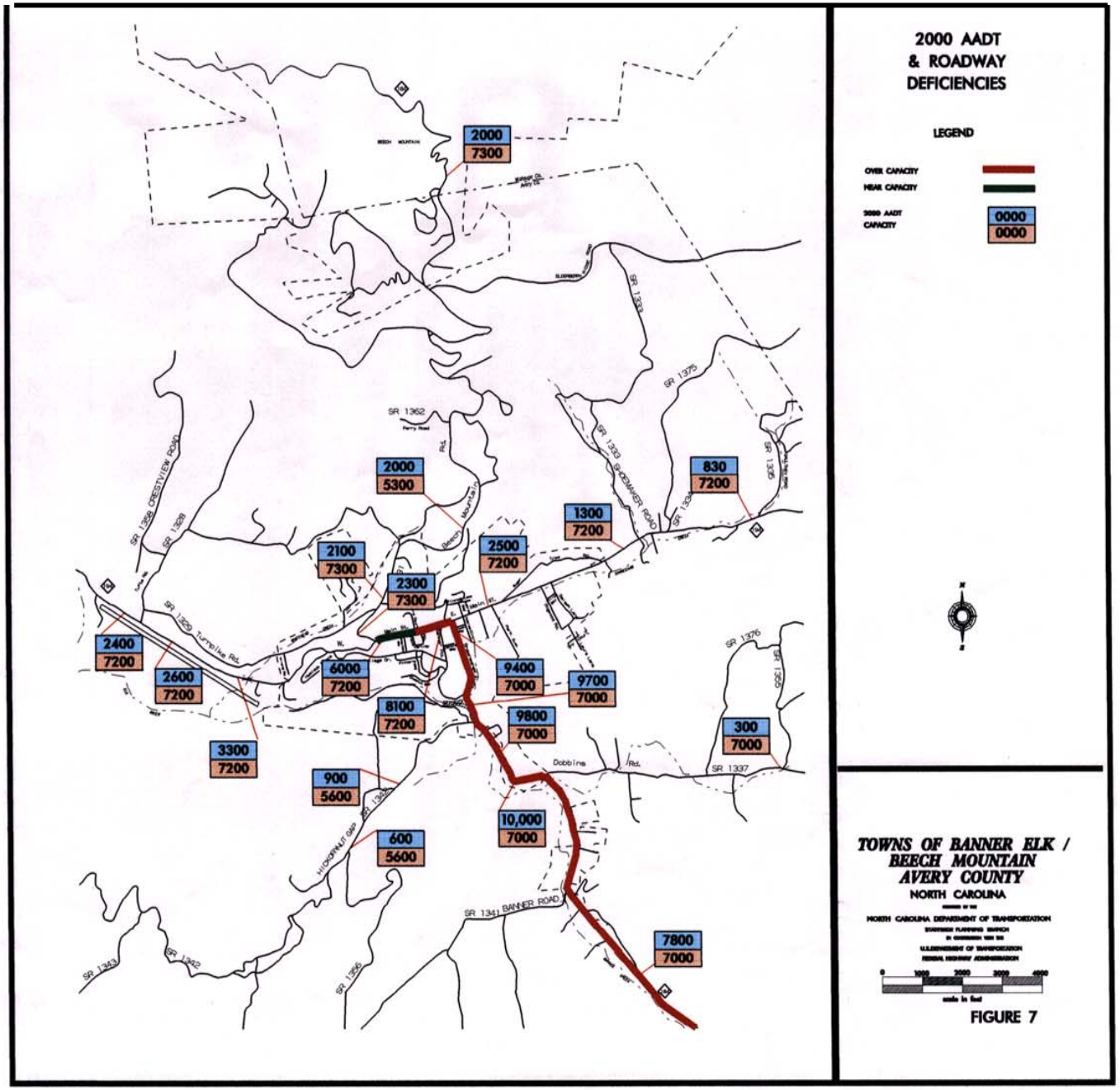
Traffic Capacity Analysis

Capacity Deficiencies - Figure 7 depicts the base year (2000) major street system, and the AADT (Annual Average Daily Traffic). A comparison of the base year AADT to capacities reveals two roadways that are expected to be near or over practical capacity (LOS D) by the year 2025. These areas are highlighted in Figure 8, and include:

- **NC 184 (Shawneehaw Ave./Beech Mountain) -** The current average daily traffic (AADT) on NC 184 varies between 7,800 and 10,000 vpd. The capacities of the existing roadway ranges between 5,300 and 7,300 vpd. The section of NC 184 between NC 194 and the southern planning area boundary is presently over capacity. By the year 2025, if no improvements are made to the existing system, this volume is expected to increase to volumes between 16,000 and 21,000 vpd and will be operating at a Level of Service (LOS) F. The future year volumes on the section between NC 194 and Beech Mountain range from 3,000 and
  4,000.

- **NC 194 (Main Street) -** The 2000 annual average daily traffic on NC 194 west of NC 184 ranges from 2,400 vpd to 8,100 vpd. The eastern portion of the route had AADT volumes between 830 and 2,500 vpd. The whole facility has a capacity of 7,200 vpd. The section in front of Lees McRae College is over capacity while, the remaining section up to Beech Mountain Road is nearing the capacity. It is projected in 2025 that this portion of NC 194 will carry between 6,000 and 15,000 vpd.

No Build Alternative - Not implementing a thoroughfare plan or elements of it could be called a No-Build Alternative. This means that there would be no new construction or roadway improvements to the Banner Elk and Beech Mountain Thoroughfare system except for routine maintenance. If no improvements are made to NC 184, NC 194 and an alternative is not constructed during the planning period, the increase traffic volumes and normal growth will result in a dramatic reduction in transportation quality. The level of service on NC 184 will drop to LOS F. At LOS F the operating speed will drop significantly, and the queues of traffic currently experienced behind slow moving vehicles will get considerably longer. The absence of improvements will negatively impact growth and business in the Banner Elk and Beech Mountain area. Figure 8 shows the existing system, assuming that no improvements are made by the design year.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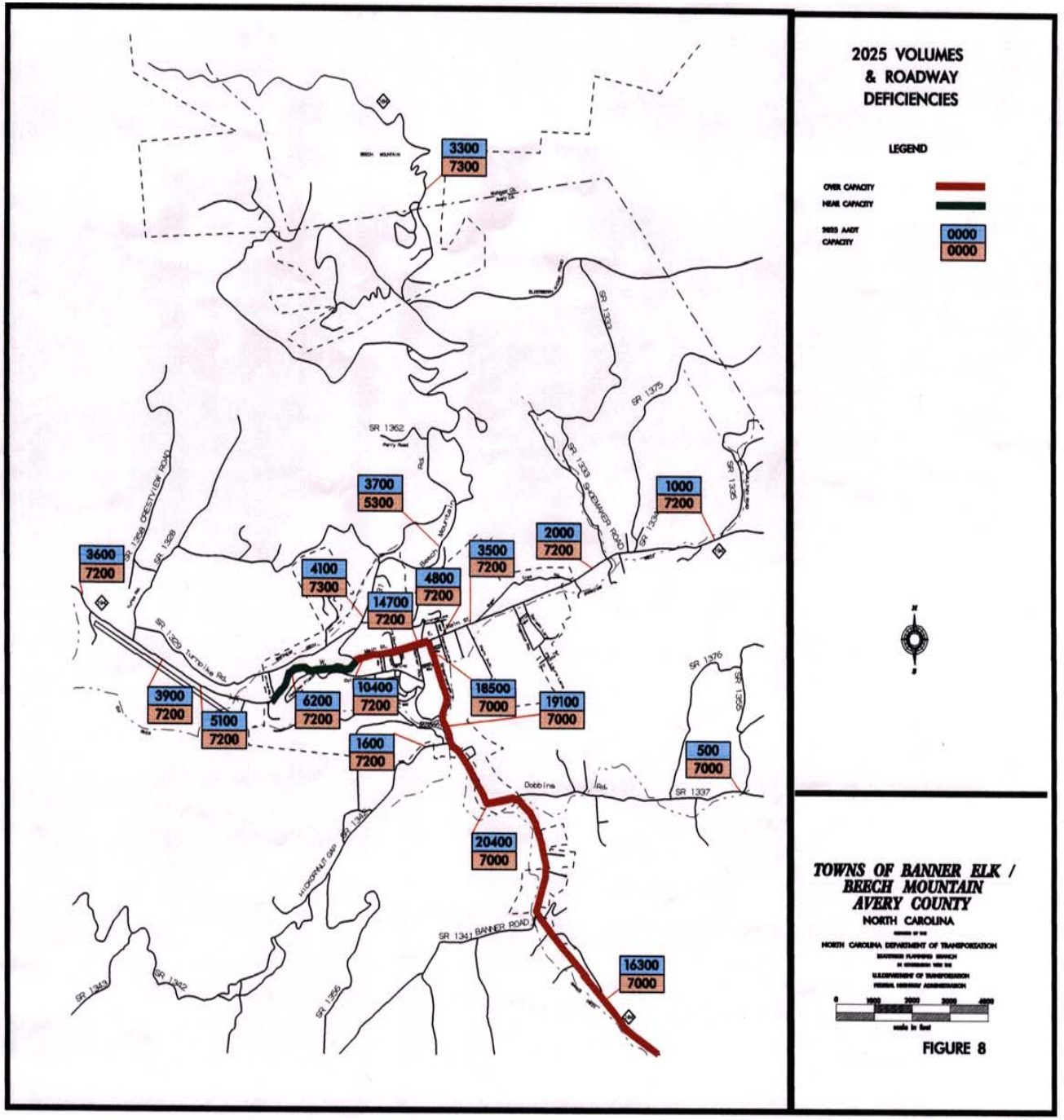
TOWNS OF BANNER ELK /
BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
FIGURE 7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SR 1363
SR 1375
SR 1359 CHESTNUT RIDGE ROAD
SR 1358
SR 1309
SR 1309 Turnpike Rd.
SR 1376
SR 1363
SR 1337
SR 1340
SR 1341 BANNER ROAD
SR 1343
SR 1342
SR 1356
Dobbins Rd.
TOWNS OF BANNER ELK /
BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
0
1000
2000
3000
4000
scale in feet
FIGURE 8

Chapter 5

Population, Land Use, and Traffic

Factors Affecting the Future Roadway System

The objective of thoroughfare planning is to develop a transportation system that will meet future travel demand and enable people and goods to travel safely and economically. To determine the needs of an area it is important to understand the role of population, economics, and land use have on the highway system. Examination of these factors help to explain historic travel patterns and lay the groundwork for thoroughfare planning process.

In order to formulate an adequate 2025-year thoroughfare plan, reliable forecasts of future travel characteristics must be achieved. The factors of population, vehicle usage trends, economy and land use play a significant role in determining the transportation needs of the area, and must be carefully analyzed. Additional items may include the effects of legal controls such as subdivision regulations and zoning ordinances, availability of public utilities and physical features of the area.

The first step in the development of the thoroughfare plan is to define the planning period and the planning area. The planning period is typically on the order of 25 to 30 years. The base year for the Banner Elk and Beech Mountain study was 2000 and the year 2025 was chosen to be the end point of the study period. The planning area is generally the limits to which urbanization is expected to occur during the planning period. The planning area is then subdivided into traffic analysis zones. Figure 9 shows the planning area boundary and zones.

Population

The amount of traffic on a section of roadway is a function of the size and location of the population, which it serves. Investigating past trends in population growth and forecasting future population growth and dispersion is one of the first steps for a transportation planner. Table 6 shows the historical and projected population trends estimated by the Office of State Budget and Management.

Table 6

Population Trends and Projections

Year	State(10^6)	Avery County	Banner Elk	Beech Mountain
1970	5.08	12,655	754	---
1980	5.88	14,200	1,087	190
1990	6.63	14,409	1,080	239
1994	7.06	15,202	614	---
1995	7.19	15,171	608	263
1996	7.32	15,229	778	264
2000	7.75	15,724	980a	303a
2005	8.21	15,880	998a	346a
2010	8.69	15,999	1,016a	389a
2015	9.14	16,035	1,035a	431a
2020	9.35	15,243	1,054a	474a
2025	9.88	16,684a	1,074a	517a

a/Projection based on past trends

The most important population estimate for development of the thoroughfare plan is that of the planning area. Even though government census data is not available for the transportation planning area, other methods of estimation of population are available. The 2000 housing "windshield" survey for this study area gave a final count of 1,357 homes inside the Banner Elk and Beech Mountain Planning Area. The housing count was then multiplied by the average persons per dwelling unit for the planning area (2.35), to give a total area population of 3,189. Population projections are shown in Table 7.

Table 7

Banner Elk and Beech Mountain Planning Area Population Forecasts

Year	Population
2000	3,189
2025	5,200

Economy and Employment

One of the more important factors to be considered in estimating the future traffic growth of an area is its economic base. The number of employers and the employee's income or purchasing power influences how much population can be supported in the area and the number of motor vehicles that will be locally owned and operated. Generally, as the family income increases so does the number of vehicles owned, as well as the number of vehicles trips generated per day by each household. An accurate projection of the future economy of the area is essential to estimating future travel demand.

Factors which will influence economic growth and development in Banner Elk and Beech Mountain over the 25 year planning period is development along the NC 184 and NC 194 corridors and in the downtown area in the Banner Elk and Beech Mountain Planning Area. The working population of Banner Elk and Beech Mountain is mainly a mixture of retail, special retail, and service industries. These three types of employment employ over 93% of the working population of Banner Elk and Beech Mountain. Table 8 Employment Break Down for Banner Elk and Beech Mountain was developed using the sum of the estimated jobs of each employer for 2000. An employment to population ratio for the planning area is applied to the projected population to estimate the future employment total. Local officials of Banner Elk and Beech Mountain also adjusted employment projections where new developments were being proposed. The total employment is then distributed into employment categories based on the market share of each in the base year and expected trends in each industry. The employment categories, which are based on Standard Industrial Classification (SIC), are described below.

Industrial – agriculture, construction, manufacturing, transportation
Retail – all types of wholesale and retail trade
Special Retail – gasoline service stations, restaurants
Office – personal, business, health, legal, education, social services
Service – finance, insurance, real estate, public administration

Table 8

Employment Break Down for Banner Elk and Beech Mountain

Type of Employment	Employment 2000	Employment 2025
Industrial	67	100
Retail	201	311
Highway Retail	125	185
Office	49	99
Service	1110	1597
Total	1552	2292

Land Use

Land use refers to the physical patterns of activities and functions within a city or county. Nearly all traffic problems in a given area can be attributed, in some form, to the type of land use. As a result of the large impact land use has on transportation, G.S. 136-66.2 has been amended to require all entities desiring transportation plans to have some form of landuse plan (i.e., comprehensive plan, strategic plan, etc.). For example, a large industrial plant may be the cause of congestion during shift change hours. However, during the remainder of the day few problems, if any, may occur. The spatial distribution of different types of land use is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories:

1. Residential - all land devoted to the housing of people (excludes hotels and motels)

2. Commercial - all land devoted to retail trade including consumer and business service and office

3. Industrial - all land devoted to manufacturing, storage, warehousing, and transportation of products

4. Public - all land devoted to social, religious, educational, cultural, and political activities.

The Towns of Banner Elk and Beech Mountain do have adopted Land Use Plans to aide in controlling the rapid growth that the Towns are currently experiencing. Determination of where expected growth is to occur within the planning area facilitates the location of proposed thoroughfares or the improvements of existing thoroughfares. Areas of anticipated development and growth for Banner Elk and Beech Mountain are:

1. Residential - A large amount of Banner Elk and Beech Mountain's residential land development is concentrated within their city limits, but many new developments are currently being built, predominantly in the northern and eastern portions of the planning area.

2. Commercial/Retail - Most of the commercial development, in Banner Elk and Beech Mountain is along NC 184 (Shawneehaw Avenue) and NC 194 (Main Street). It is anticipated that theses corridors will continue to flourish in the future.

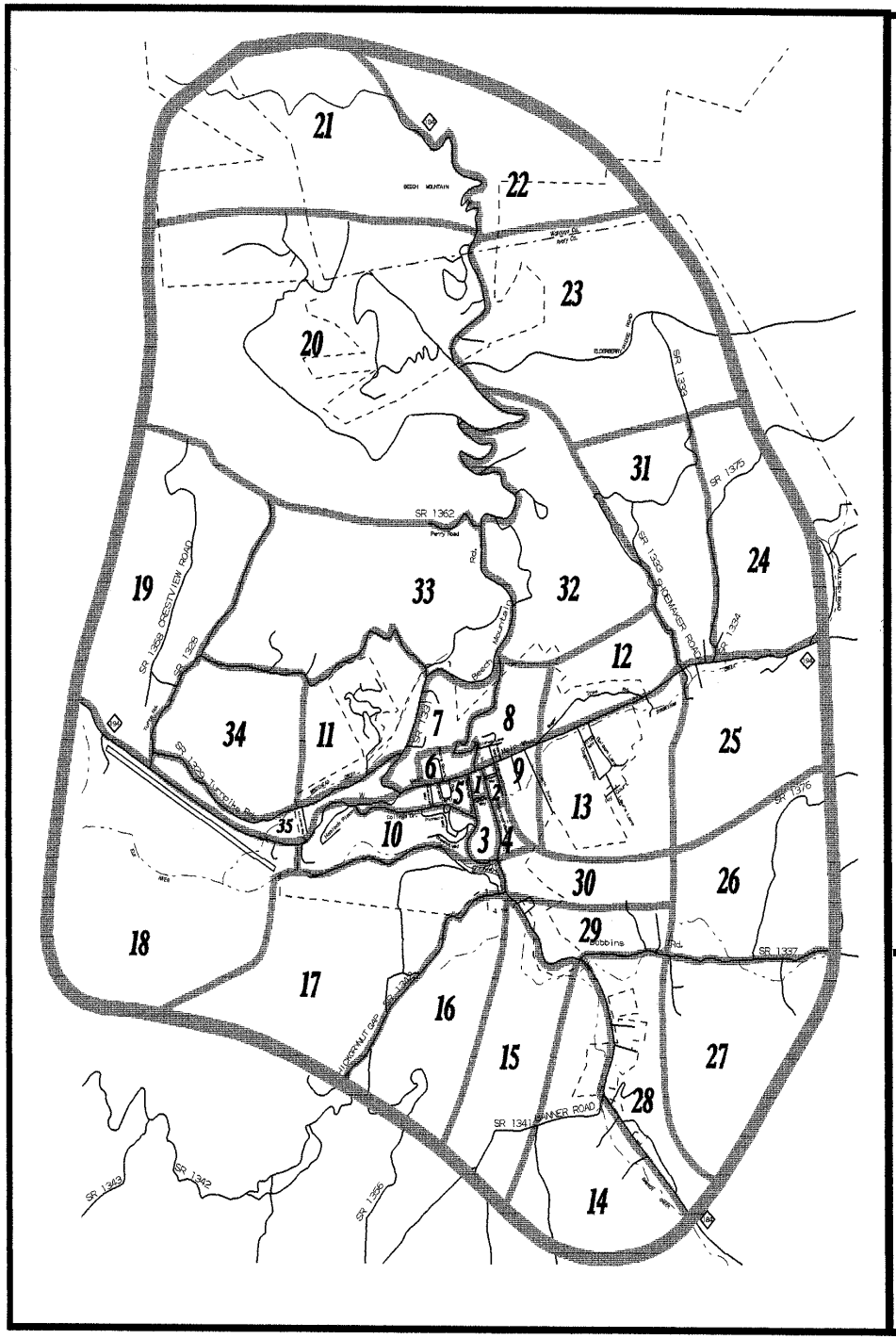
3. Industrial - The industrial development in Banner Elk and Beech Mountain is located in concentrated areas throughout the planning area. However, the highest concentration is in the southern portion of the planning area.

5. Public - The Town of Banner Elk and Beech Mountain has several public areas and reserved open spaces within the planning area.

The western and southern portions of the planning area have the largest growth expectations. Hopefully, the implementation of the thoroughfare plan will help alleviate any traffic congestion due to new development.

Future Travel Demand

Travel demand is generally reported in average daily traffic counts. Traffic counts are taken regularly in and around Banner Elk and Beech Mountain by the North Carolina Department of Transportation. To estimate future travel demand, traffic trends over the past twenty-five years were studied. The largest growth was noted on lower volume roads, where a given increase will result in a higher percentage. Figures 6 and 7 shows existing and expected traffic volumes for the Banner Elk and Beech Mountain Planning Area. The introduction of new residential and commercial developments in the planning area will cause increases in traffic growth in those immediate areas. Eventually, this increase will level off and follow the growth pattern of the surrounding area. For a summary of travel statistics for the Banner Elk and Beech Mountain Planning Area refer to Table 11 in Chapter 7.



ZONE MAP

LEGEND

CORDON LINE

ZONE LINE

ZONE NUMBER 000

N

S

TOWNS OF BANNER ELK / BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH
IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

0 1000 2000 3000 4000

scale in feet

FIGURE 9

Chapter 6

Environmental Concerns

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act, Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have a significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, historic properties, wildlife, and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several of these factors and is included below.

Wetlands

In general terms, wetlands are lands where saturation with water is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature that most wetlands share is soil or substrata that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystems in our environment. They help regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing floodwaters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, and reducing erosion. They are also critical to fish and wildlife populations. Wetlands provide an important habitat for about one third of the plant and animal species that are federally listed as threatened or endangered.

In this study, the impacts to wetlands were determined using the National Wetlands Inventory Mapping, available from the U. S. Fish and Wildlife Service. The location of wetlands throughout Banner Elk and Beech Mountain are shown in Figure 10.

Wetland impacts have been avoided or minimized to the greatest extent possible while preserving the integrity of the transportation plan.

Threatened and Endangered Species

A preliminary review of the Federally Listed Threatened and Endangered Species within Banner Elk and Beech Mountain's Planning Area was done to determine the effects that new corridors could have on the wildlife. The species are identified using mapping from the North Carolina Department of Environment, Health, and Natural Resources.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants and animals and critical wildlife habitats. By locating rare species in the planning stage of road construction, we are able to avoid or minimize these impacts.

The review did not find any State listed threatened or endangered species in the Banner Elk and Beech Mountain Planning Area. However, a detailed field investigation is recommended prior to construction of any highway project in this area.

Historic Sites

The location of historic sites in Banner Elk and Beech Mountain was investigated to determine the possible impacts of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the State of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. The DOT must consider the impacts of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed on the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with the North Carolina Historical Commission, but it is not bound by their recommendations.

There are currently three properties in the Banner Elk and Beech Mountain Planning Area that are eligible to be listed. The properties include the Banner Elk Hotel, Banner Elk Presbyterian Church, and the Lees McRae College.

These property should not be affected by the projects proposed on the thoroughfare plan. However, care should be taken to make certain that all historic sites and natural settings are preserved. Therefore, a closer study should be done in regard to the local historic sites prior to the construction of any proposal.

Archaeology

There are a various archaeology sites located in the Banner Elk and Beech Mountain Planning Area, but most sites found nothing of significance. The sites were mainly concentrated in southwestern portion of the planning area. Most of these small sites have probably been destroyed over the years. However, care should be taking to make sure that any possible archaeological sites should be looked at closer prior to the construction of any proposals.

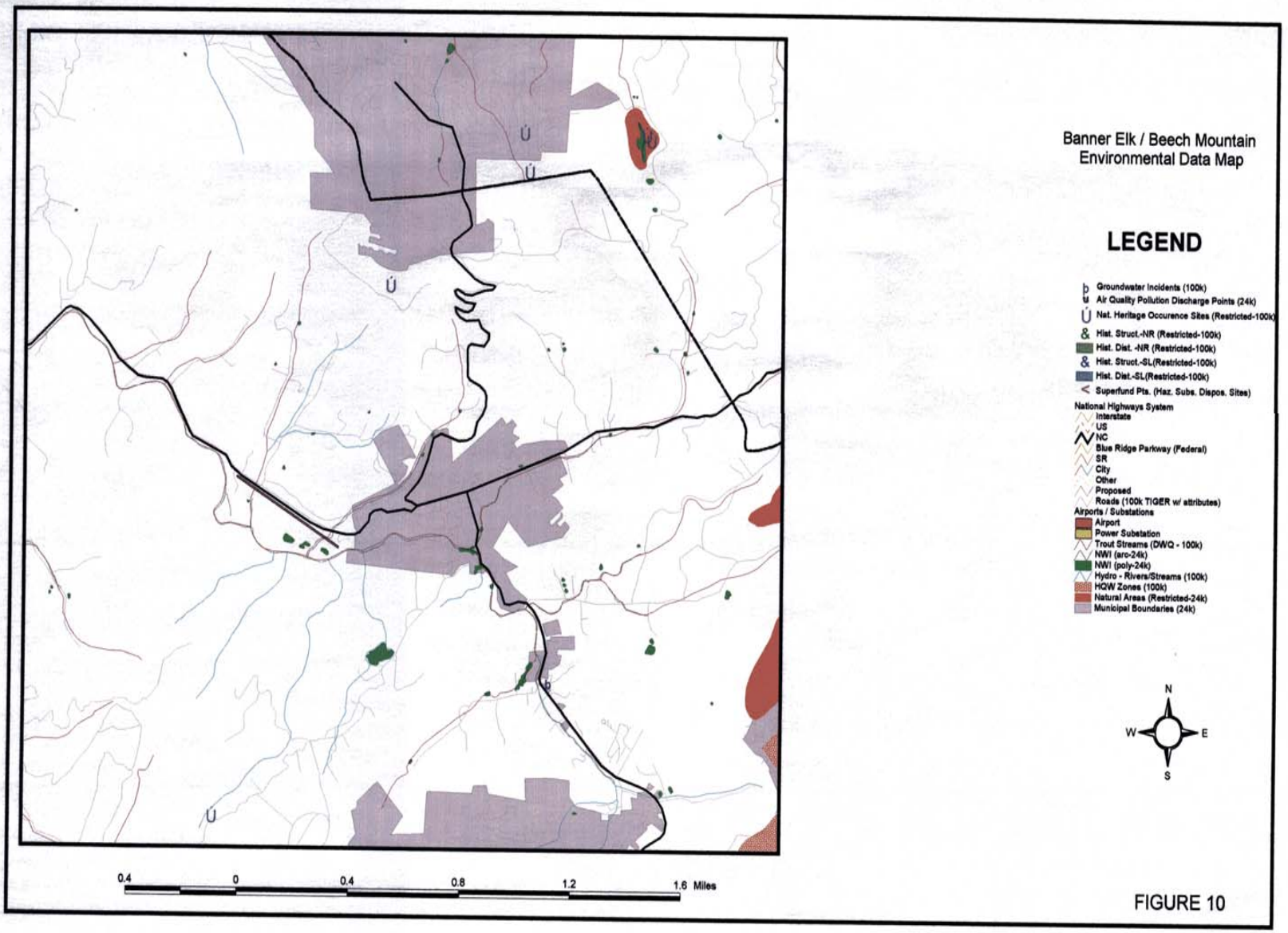

Banner Elk / Beech Mountain
Environmental Data Map
LEGEND
Groundwater Incidents (100k)
Air Quality Pollution Discharge Points (24k)
Nat. Heritage Occurence Sites (Restricted-100k)
Hist. Struct.-NR (Restricted-100k)
Hist. Dist. -NR (Restricted-100k)
Hist. Struct.-SL(Restricted-100k)
Hist. Dist.-SL(Restricted-100k)
Superfund Pts. (Haz. Subs. Dispos. Sites)
National Highways System
Interstate
US
NC
Blue Ridge Parkway (Federal)
SR
City
Other
Proposed
Roads (100k TIGER w/ attributes)
Airports / Substations
Airport
Power Substation
Trout Streams (DWQ - 100k)
NWI (arc-24k)
NWI (poly-24k)
Hydro - Rivers/Streams (100k)
HQW Zones (100k)
Natural Areas (Restricted-24k)
Municipal Boundaries (24k)
N
W
E
S
0.4
0
0.4
0.8
1.2
1.6 Miles

FIGURE 10

Chapter 7

Traffic Model Development

In order to develop an efficient thoroughfare plan for the Town of Banner Elk and Beech Mountain it was necessary to develop and calibrate a traffic model of the Town. Developing a traffic model requires the following steps: defining the study area, and projecting socioeconomic data to the design year. Once the socioeconomic data has been projected the model may be used to evaluate various street system problems and alternate solutions to the problems.

The Study Area

The study of Banner Elk and Beech Mountain includes the city limits and some additional outlying areas (Figure 9). This area was divided into 35 zones for data collection and aggregation. These zones reflect similar land use throughout the planning area. The data for the dwelling units and employment for 2000 was collected from census data and windshield surveys. The projections of socioeconomic data to the future year were done based on past trends from previous census data, projections by the Office of State Planning, and input from Banner Elk and Beech Mountain.

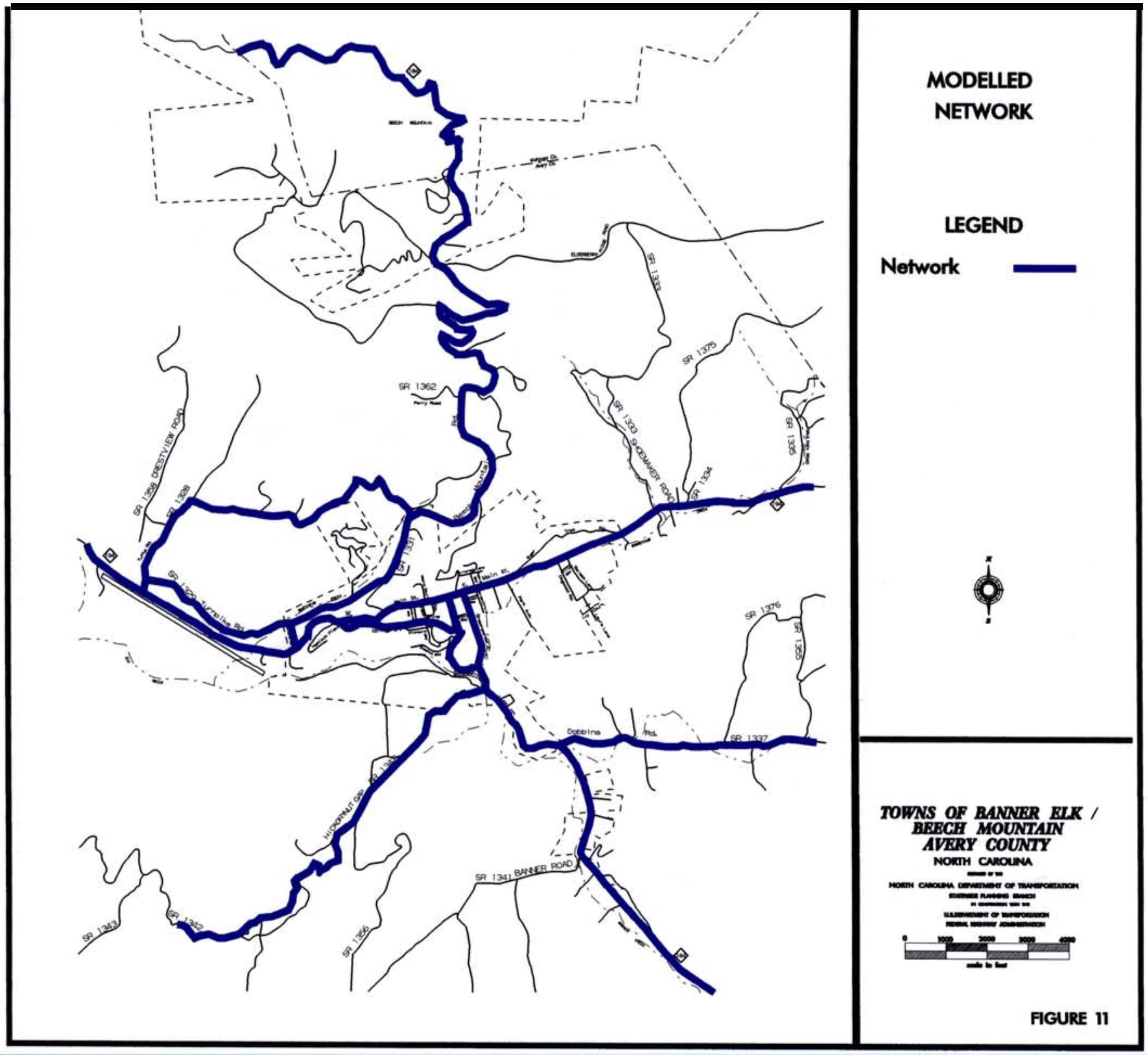
The Base Year Network

The purpose of the traffic model is to replicate the conditions on the Town street system. Therefore, it is necessary to represent the existing street system in the model. There is a balance between having too many streets on the model to allow it to be calibrated and not having enough streets to realistically duplicate existing conditions. Generally, all the major arterials and some of the major land access or collector streets need to be represented.

Street capacity is an important component of the model. The volume\ capacity ratio (v\c) gives us our best indication of present and future traffic congestion. Speed and distance are the major factors that define the minimum time paths form zone to zone. The model uses the minimum time paths as the basis for assigning traffic to streets. Generally in the Banner Elk and Beech Mountain model the speeds assigned to links of the street system are at or slightly below the posted speed limit. Figure 11 shows the Transcad Network overlaid on the actual street system.

Data Requirements

In order to produce an adequate traffic model of the study area, two additional types of data are required. First, traffic counts on routes used in the model provide a basis for calibrating the model. These traffic counts show a snapshot of traffic conditions in the study area. Second, socioeconomic data (housing counts and employment estimates) are necessary in order to generate traffic for the model. The housing and socioeconomic data for the model are shown in Figures 13 and 14.


MODELLED
NETWORK
LEGEND
Network
SR 1362
SR 1375
SR 1376
SR 1337
Dobbins
SR 1341 BANNER ROAD
SR 1342
SR 1343
SR 1356
TOWNS OF BANNER ELK /
BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
0
1000
2000
3000
4000
FIGURE 11

Traffic Counts

The model must be calibrated against existing conditions in the study area. In order to calibrate the model, traffic counts must be taken at various locations around the study area. The counts for much of the Banner Elk and Beech Mountain study were collected in 2000. Traffic count locations are found in Figure 12.

Also, volumes on all routes crossing the planning area boundary were counted. These counts show how much traffic is entering and exiting the study area.

Socioeconomic Data

The required socioeconomic data consists of housing counts and employment estimates. The housing counts are used in the model as the generator of trips and employment is used as the attractor of trips.

The best indicator of the average number of trips made from a household is the income. Since there is no adequate method for determining household income, the type and quality of housing was used as an indicator of household income. The Statewide Planning staff conducted a windshield survey in 2000 to collect housing and employment data. The housing inventory was divided into five categories: excellent, above average, average, below average, and poor. Each of these categories was assigned a slightly different trip generation rate. Figure 13 shows the housing counts for each traffic zone.

The employment data that was collected was broken out by Standard Industrial Code classification and grouped into five categories: industry, special retail, retail, office and services. The number of employees of each business was estimated. This data was used with a regression equation developed from an origin and destination survey of a similar size Town to produce an attraction factor for each zone. Figure 14 shows total employment by traffic analysis zone.

Commercial Vehicles

Commercial vehicles have somewhat different trip generation characteristics than do privately owned vehicles. An inventory of commercial vehicles was done at the same time as the employment and housing inventory for the study area.

Trip Generation

The trip generation process is the process by which external station volumes, housing data, and employment data are used to generate traffic volumes that duplicate the traffic volumes on the street network. The technical definition of a trip is slightly different then the definition of a trip used by the general public. Technically a trip only has one origin and one destination while the layman will often group, or chain, several short trips together as one longer trip.

Traffic inside the study area has three major components: through trips, internal-external trips, and internal trips. Through trips are produced outside the planning area and pass through enroute to a destination outside the planning area. Internal-external trips have one end of the trip outside of the planning area. Internal trips have both their origin and destination inside the planning area. For clarity the internal trips are further subdivided into trip purposes. The trip purposes for Banner Elk / Beech Mountain are home-based work, other-home based, and non-home based.

Through Trips

The Through Trip Table for this study was developed based on Technical Report 3 (Synthesized Through Trip Table for Small Urban Areas By Dr. David G. Modlin, Jr.).

Once these volumes were developed, the Fratar balancing method was then used to balance the trip interchanges so that the total number of through trips at each external station is consistent with the total number of through trips at every other station. Generally five iterations are sufficient to balance the estimate trips between external zones.

External - Internal

The external-internal trip volume was determined by subtracting the through trip volume at each station from the total traffic volume at that station. See Table 11 for external-internal and through trip values.

Internal Data Summary (IDS)

IDS is the process that takes the external-internal traffic volumes, housing data, employment data, generation rates, and regression equations and generates the trip productions and trip attractions required by the gravity model. Housing units were stratified to account for differing trip generation rates for each classification. The individual trip generation rates give an average trip generation rate for the study area of 4.91 trips per dwelling unit (du) for 2000. This is lower than state average of 7 to 8 trips per dwelling unit. The lower rate is a result of the area be more of a tourist/ retirement community. Trip attractions were produced using regression equations. The regression equations consider trip attractions to be related to the employment characteristics of the traffic zones. The regression equations for Banner Elk and Beech Mountain are:

$$HBW\ Y = 1.00X_1 + 1.00X_2 + 1.00X_3 + 1.00X_4 + 1.00X_5$$
$$OHB\ Y = .80X_1 + 5.0X_2 + 8.0X_3 + 4.5X_4 + 3.9X_5$$
$$NHB\ Y = .80X_1 + 5.0X_2 + 8.0X_3 + 4.5X_4 + 3.9X_5$$
$$EXT\ Y = .80X_1 + 5.0X_2 + 8.0X_3 + 4.5X_4 + 3.9X_5$$

Where:
- Y = Attraction factor for each zone
- X_1 = Industry (SIC codes 1-49)
- X_2 = Retail (SIC codes 55,58)
- X_3 = Special Retail (SIC codes 50-54, 56, 57, 59)
- X_4 = Office (SIC codes 60-67, 91-97)
- X_5 = Services (SIC codes 70-76, 78-89, 99)

The output of the IDS program are trip productions and trip attractions for each zone divided into four trip purposes: home-based work, home-based other, non-home based and external-internal. The trips are segregated into trip purposes because different trip lengths are associated with each trip purpose.

Internal Trip Distribution

Once the number of trips per traffic zones are determined, the trips must still be distributed to other traffic zones. The preferred method of distributing internal and external-internal trips, called the 'Gravity Model', states that the number of trips between Zone A and Zone B is multiplied by a travel time factor. The gravity model takes the form:

$$T_{ij} = \frac{P_i \times A_j \times F_{ij}}{\text{Sum } x=1,n \text{ of } A_x \times F_{t,x}}$$

T_{ij} = The number of trips produced in zone I and attracted to zone j.
P_i = The number of trips produced in zone i.
A_j = The number of trips attracted to zone j.
F_{ij} = The travel time factor.
n = The total number of zones.
i = The origin zone number.
j = The destination zone number.
x = Any zone number.

The travel time factor or friction factor (F) is critical to the gravity model distribution and must be derived empirically. The friction factor is dependent on the distance between the traffic zones and the time necessary to travel these distances. This factor is also dependent on the trip purpose. In order to derive this factor a gravity model calibration program is run with an initial friction factor and trip length frequency curve for each trip purpose. The initial friction factors used in the Banner Elk and Beech Mountain model were borrowed from another area having similar characteristics. Table 12 shows the actual values used for the friction factors and trip length frequency curves.

Model Calibration

The purpose of a traffic model is to predict the traffic on a street system at some future point in time; however, if the model is not accurate, it is useless for this purpose. Therefore, the model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, trip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict traffic in the future**.** The model was calibrated with 2000 Average Daily Traffic Counts on all routes.

Accuracy Checks

There are three checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model, and that no trips have been counted twice.

The second check is to compare the model generated trips on the screenlines with the ground counts taken at the screenlines. A model is considered to accurately reflect the overall patterns if

the trips it generates are from 95% to 105% of the ground counts on the screenlines. Table 9 compares the ground counts with the model traffic volumes on the screenlines.

The final check for the model is to match the traffic volumes on the links in the model with the ADT at the same locations. The 'link counts' can be used to find particular places in the network where there are problems. Comparing the link counts with the ground counts for those links did not reveal any significant problems with the model.

Table 9

Actual vs. Model Screenline Total

Screenline	Ground Count	Model Volume	Percent
A NS	12,500	12,566	1.01
B EW	5,400	5,162	0.96

Data Projections to the Design Year

In order to make use of the model the base year data must be modified to reflect assumed conditions in the design year. These projections and the previously developed regression equations were used to produce trip productions and attractions in the same manner as the base year.

Dwelling Unit Projections

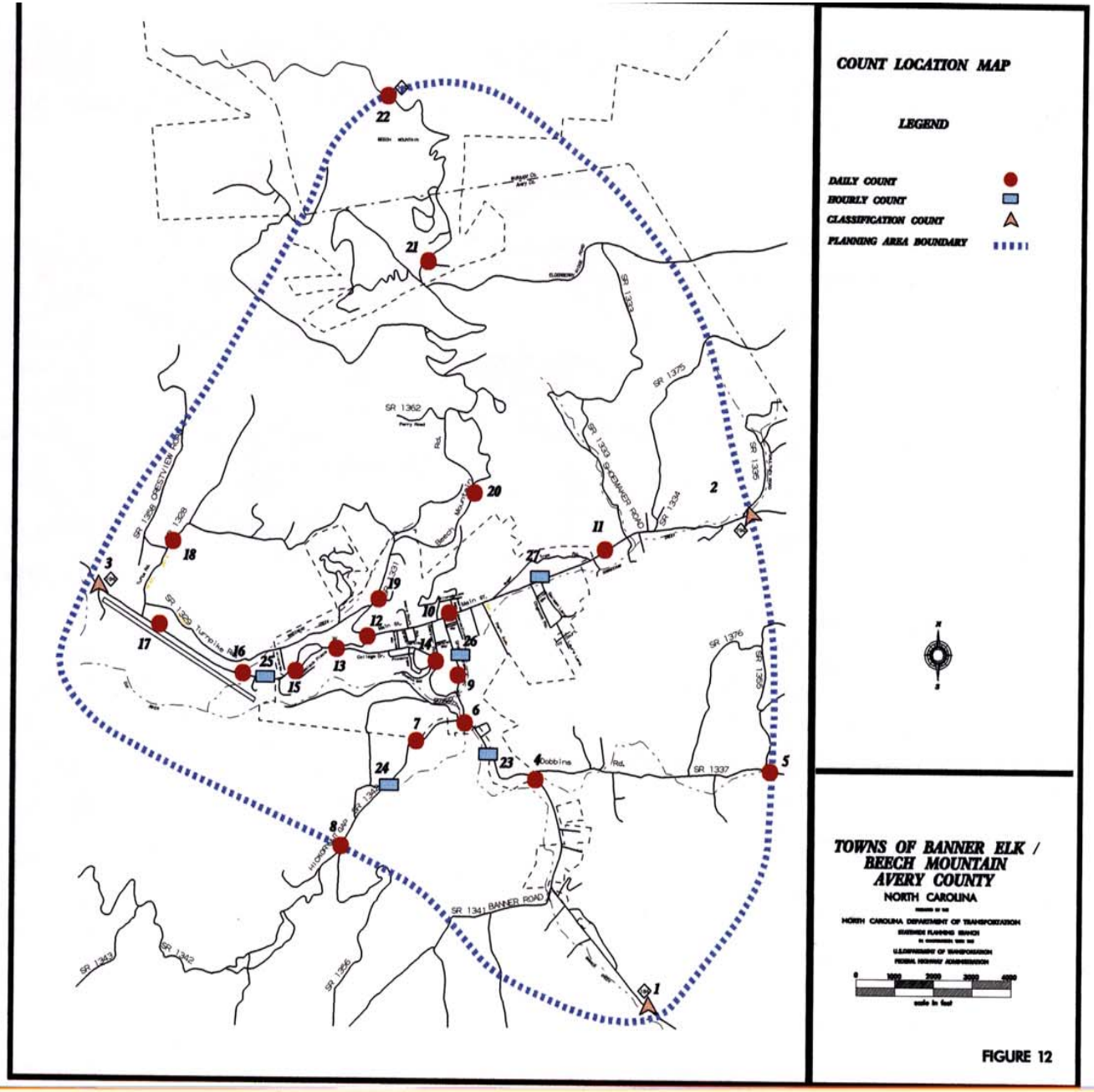
Future dwelling units were determined by extending person per dwelling unit trends for Avery County linearly to the design year. The Statewide Planning Branch projected residential growth and with the help of the Planning Board distributed these houses throughout the planning area. Figure 13 compares the classification of dwelling units in 2000 with the assumed classification in 2025.

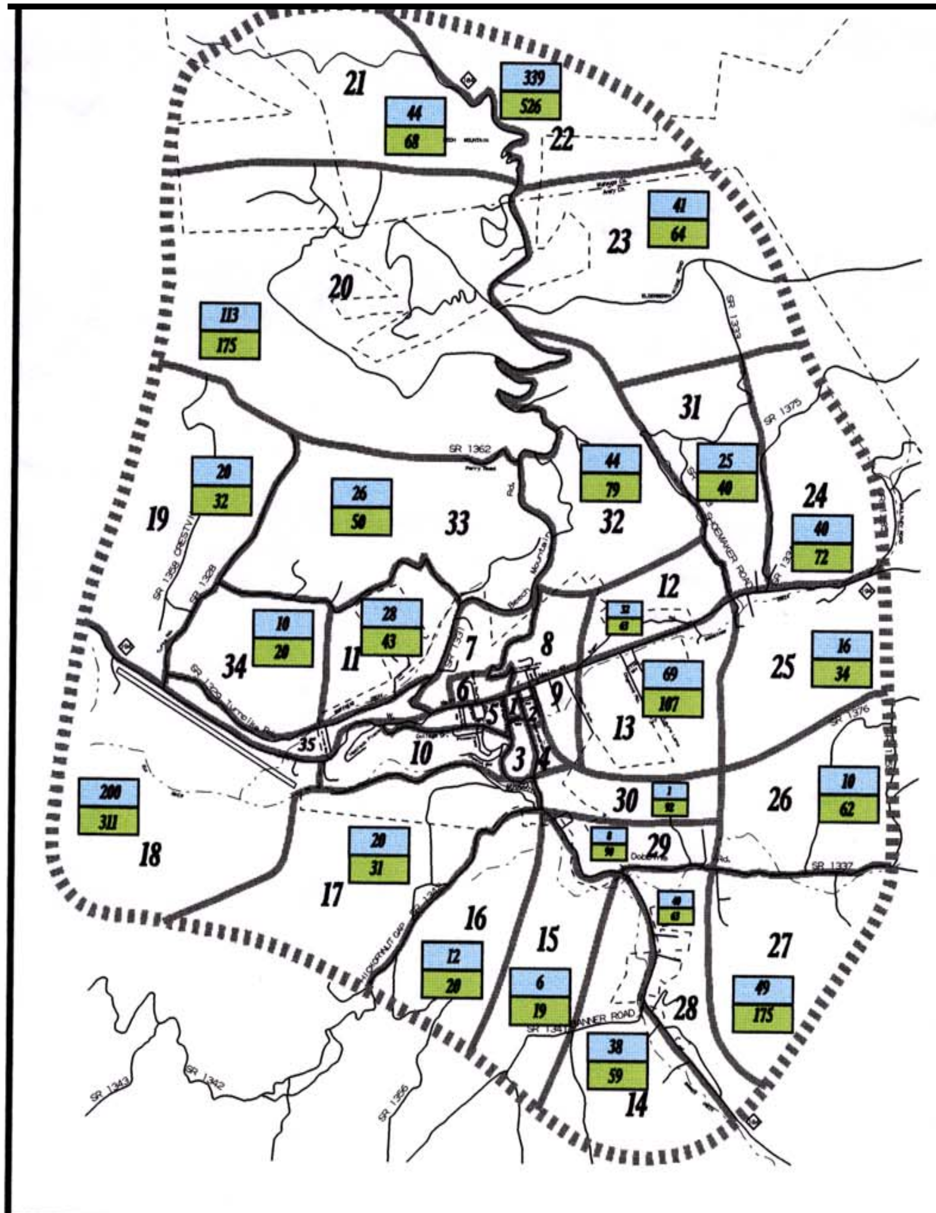
Employment Projections

The Statewide Planning Branch and the Planning Board also projected and distributed the 2025 employment to the zones they anticipated employment growth. Those projections were added to the 2000 data. Employment projections throughout the planning area indicated steady growth. Figure 14 compares the classification of employment data in 2000 with the assumed classification in 2025.

External and Through Trips

For the design year, external and through trip were projected from the base year using a linear projection of the past growth rate at each external station. Cordon station data can be found in Table 13.


COUNT LOCATION MAP
LEGEND
DAILY COUNT
HOURLY COUNT
CLASSIFICATION COUNT
PLANNING AREA BOUNDARY
TOWNS OF BANNER ELK / BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
FIGURE 12
SR 1341 BANNER ROAD
SR 1337
SR 1333
SR 1375
SR 1362
SR 1304
SR 1376
SR 1343
SR 1342
SR 1356
Dobbins Rd.



HOUSING TOTALS BY ZONE

LEGEND

Planning Boundary

Zone Boundary

2000 Housing 000

2025 Housing 000

Zone Number 00

Zone Number	2000 Housing	2025 Housing
1	2	2
2	0	0
3	3	10
4	7	11
5	0	0
6	6	10
7	38	59
8	38	59
9	1	2
10	12	19
35	19	31

TOWNS OF BANNER ELK / BEECH MOUNTAIN AVERY COUNTY

NORTH CAROLINA

FIGURE 13

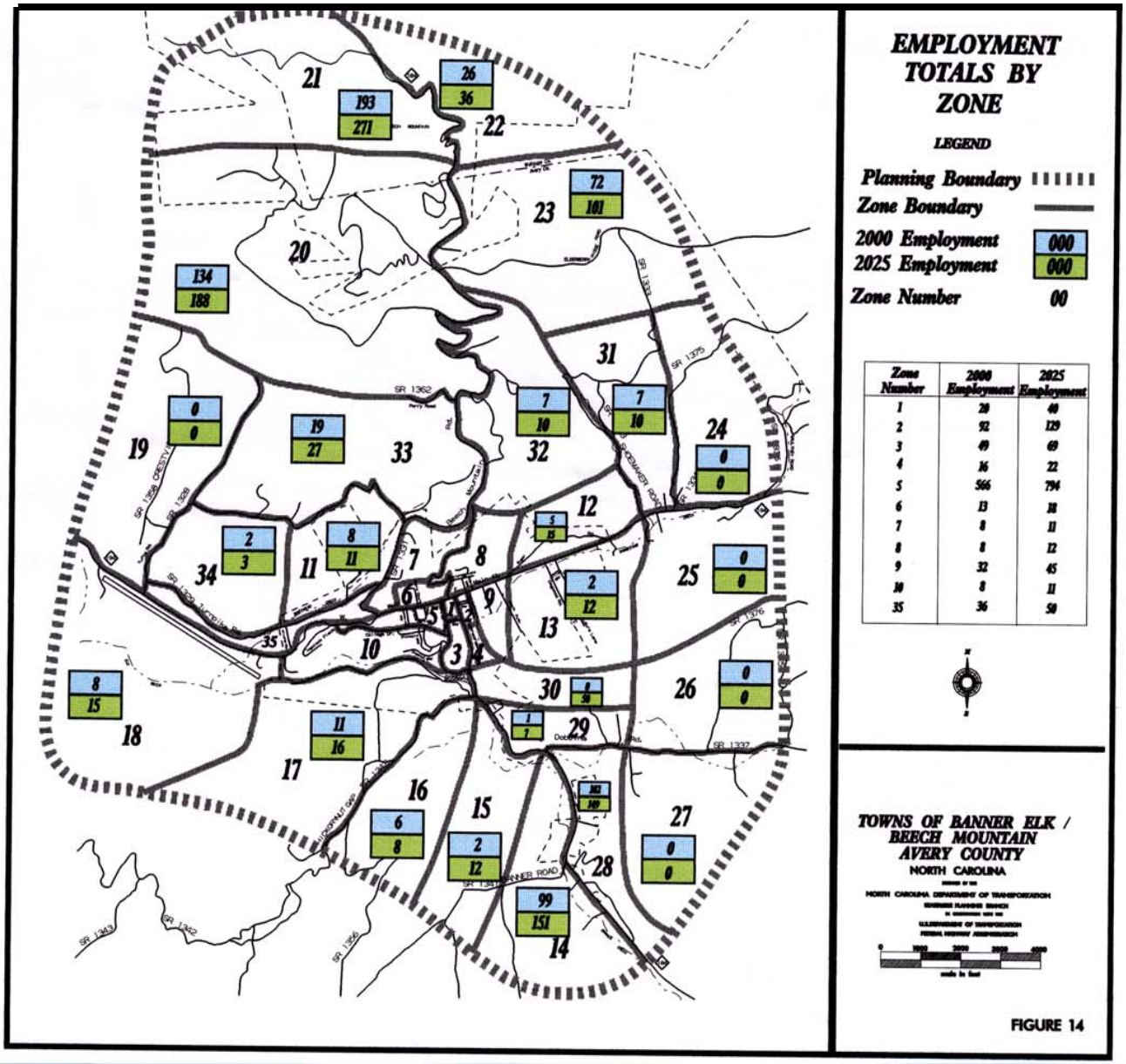

EMPLOYMENT TOTALS BY ZONE
LEGEND
Planning Boundary
Zone Boundary
2000 Employment
2025 Employment
Zone Number
Zone Number | 2000 Employment | 2025 Employment
1 | 29 | 40
2 | 92 | 129
3 | 49 | 69
4 | 16 | 22
5 | 566 | 794
6 | 13 | 18
7 | 8 | 11
8 | 8 | 12
9 | 32 | 45
10 | 8 | 11
35 | 36 | 50
TOWNS OF BANNER ELK / BEECH MOUNTAIN
AVERY COUNTY
NORTH CAROLINA
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
TRANSPORTATION PLANNING BRANCH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
SR 1362
SR 1375
SR 1376
SR 1337
SR 1343
SR 1342
SR 1356
SR 1341 BANNER ROAD

FIGURE 14

Table 10

Travel Model Input Variables

Trip Percentages by Purpose	Year	Persons/DU	Persons/Veh
Internal of Total 80%			
HBW 28%	2000	2.35	1.09
OHB 47%			
NHB 25%	2025	2.10	1.05

Composite Factor

$$\text{Composite Factor} = \frac{\text{2000 Persons/Veh}}{\text{2025 Persons/Veh}} \times \text{Usage Factor} \times \frac{\text{2025 Persons/DU}}{\text{2000 Persons/DU}}$$

$$\text{Composite Factor} = \frac{1.09}{1.05} \times .99 \times \frac{2.10}{2.35} = .92(\text{ used } 1.00)$$

Increase For Design Year Generation Rates

Generation Rates = Average 2000 Trip Rate X Composite Factor - Average 2000 Trip Rate

Increase for 2025 Generation Rates = 0 (4.91 X 1.00) - 4.91 = 0, therefore generation rates will remain unchanged.

Secondary NHB Trip Development

Secondary NHB Trips = Total Ext-Int Trips - Ext-Int Trips Garaged Inside Planning Area X NHBS Factor*

2000 Secondary Trips = (6,556- 1,345) X 0.30 = 1,563

2025 Secondary Trips = (14,317 – 2,455) X 0.30 = 3,559

The breakdown of internal trips by purpose and total of non-home based trips generated externally are shown in Table 11.

*Assumed NHB trip making rate per each one-way external-internal trip by vehicles garaged outside the planning area.

Table 11

Travel Data Summary

Type		2000	2025
Average Daily Trips per DU		4.91	4.84
Internal Trips		5,380	9,818
Home Based Work		1,506	2,749
Other Home Based		2,529	4,614
Non-Home Based, Internal		1,345	2,455
NHB Secondary		1,563	3,559
Internal <-> External		6,556	12,734
Through Trips		5,424	9,783
	Total Daily Trips	18,923	35,894

Table 12

Friction Factors & Travel Curve Data
Banner Elk and Beech Mountain

	Friction Factors				Travel Curves			
					% Trips Distributed			
Time Interval	HBW	OHB	NHB	Ext - Int	HBW	OHB	NHB	Ext-Int
1	5697	5135	50	3000	2.40	2.31	0.31	0.01
2	10198	8545	7000	23050	10.30	10.75	0.20	2.50
3	14433	11505	7898	27329	22.06	20.08	18.50	4.68
4	16502	12913	43000	24935	21.48	22.12	31.78	38.69
5	15826	12499	210000	18264	8.76	9.67	18.15	39.94
6	24000	20622	45000	11202	6.96	8.22	7.54	10.78
7	10000	6200	1500	4000	6.51	7.53	6.72	1.60
8	2070	2041	2200	3500	6.33	4.91	5.03	0.96
9	2881	1900	800	6000	6.02	4.79	4.55	0.36
10	3409	2600	1100	1000	4.65	4.32	3.81	0.16
11	1500	1188	2021	200	1.99	2.35	2.05	0.13
12	1999	1680	500	152	1.43	1.47	0.70	0.13
13	1810	1407	50	88	1.12	1.48	0.67	0.07

Table 13

Cordon Station Travel

Computer Station	Base Year - 2000			Future Year - 2025		
	Total ADT	Thru Trip End	Ext - Int Trips	Total ADT	Thru Trip End	Ext - Int Trips
46	50	4	46	81	6	75
47	830	66	764	1,005	80	925
48	300	28	272	470	44	426
49	7,800	2,712	5,088	16,330	5,682	10,648
50	600	264	336	1030	450	580
51	2,400	2,350	50	3600	3,520	80

APPENDICES

Appendix A

Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land access, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permits travel from origins to destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, elements are classified as major thoroughfares, minor thoroughfares, or local access streets.

Major Thoroughfares

These routes are the primary traffic arteries of the urban area and they accommodate traffic movements within, around, and through the area.

Minor Thoroughfares

Roadways classified under this under this type collect traffic from the local access streets and carry it to the major thoroughfare system.

Local Access Streets

This classification covers streets that have a primary purpose of providing access to the abutting property. This classification may be further classified as either residential, commercial and/or industrial depending upon the type of land use that they serve.

Idealized Major Thoroughfare System

The coordinated system of major thoroughfares that is most adaptable to the desired lines of travel within an urban area and that is reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, crosstowns, loops, and bypasses (Figure A-1).

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of crosstown streets that form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be form an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic that has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the urban area. The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial development affect major street and highway locations. Conversely, the

location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

* To provide for the orderly development of an adequate major street system as land development occurs;

* To reduce travel and transportation costs;

* To reduce the cost of major street improvements to the public through the coordination of the street system with private action;

* To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;

* To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;

* To reduce environmental impacts, such as air pollution, resulting from transportation, and

* To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include:

* **Street widening -** widening of a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic.

* **Intersection improvements -** increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection.

* **Improving vertical and horizontal alignment -** reduces the congestion caused by slow moving vehicles.

* **Eliminating roadside obstacles -** reduces side friction and improves a driver's field of sight.

Operational ways to improve street capacity include:

* **Control of Access -** a roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.

* **Parking removal -** Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

* **One-way operation -** The capacity of a street can sometimes be increased 20 -50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

* **Reversible lane -** Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

* **Signal phasing and coordination -** Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

* **Carpools -** Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

* **Alternate mode -** Encourage the use of transit and bicycle modes.

* **Work hours -** Encourage industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will spread peak travel over a longer time period and thus reduce peak hour demand.

* **Land use -** Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice thoroughfare planning is done for established urban area and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Through the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.

2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few streets.

3. The plan should conform to and provide for the land development plan for the area.

4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.

5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

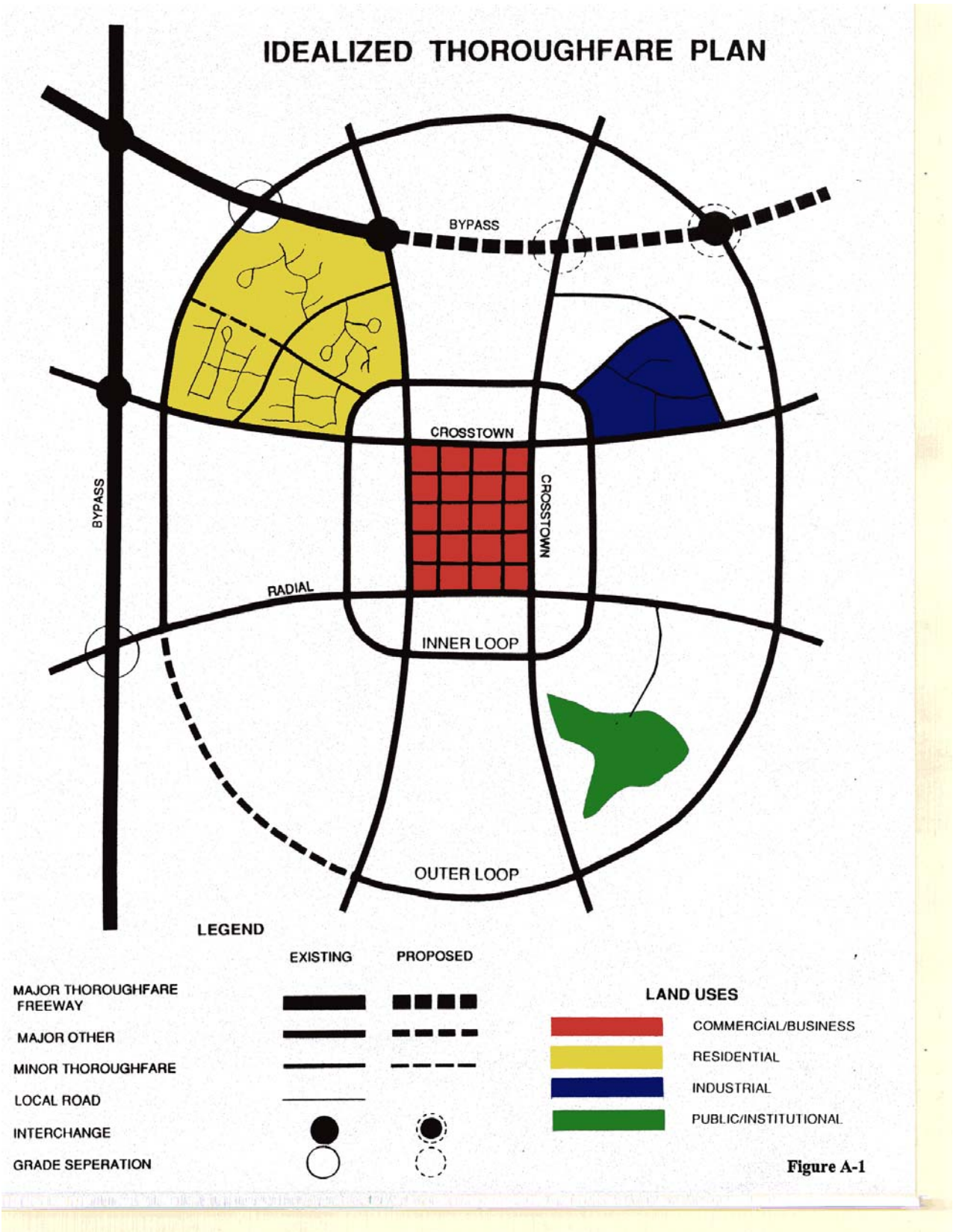

IDEALIZED THOROUGHFARE PLAN
BYPASS
CROSSTOWN
BYPASS
CROSSTOWN
RADIAL
INNER LOOP
OUTER LOOP
LEGEND
EXISTING
PROPOSED
MAJOR THOROUGHFARE FREEWAY
MAJOR OTHER
MINOR THOROUGHFARE
LOCAL ROAD
INTERCHANGE
GRADE SEPERATION
LAND USES
COMMERCIAL/BUSINESS
RESIDENTIAL
INDUSTRIAL
PUBLIC/INSTITUTIONAL

Figure A-1

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all streets identified as elements of the Towns of Banner Elk and Beech Mountain Thoroughfare Plan. The table includes a description of each section, as well as the length, cross section, and right-of-way for each section. Also included are existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommended cross sections are given in the form of an alphabetic code. A detailed description of each of these codes and an illustrative figure for each can be found in Appendix C.

The following index of terms may be helpful in interpreting the table:

NPB - Northern Planning Boundary

EPB - Eastern Planning Boundary

WPB - Western Planning Boundary

SPB - Southern Planning Boundary

SWPB – Southwestern Planning Boundary

NCL - Northern City Limits

SCL - Southern City Limits

WCL - Western City Limits

ECL - Eastern City Limits

ADQ - Adequate

N/A - Not Available

Appendix B

Thoroughfare Plan Street Tabulation and Recommendation

FACILITY & SECTION	EXISTING CROSS SECTION							RECOMMENDATIONS		
	DIST mi	RDWY ft	ROW ft	NO. OF LANES	PRACTICAL CAPACITY	ADT 2000	ADT 2025	RDWY X-SECT	PRACTICAL CAPACITY	2025 ADT
NC 184										
SPB - SR 1337 Dobbins Road	2.00	22	60	2	7,000	7,800	16,000	E	14,000	16,000
Dobbins Rd - SR 1342 Hickory Nut Gap	0.50	22	60	2	7,000	8,300	20,000	E	14,000	13,000
Hickory Nut Gap - NC 194	0.47	22	60	2	7,000	8,100	19,000	E	14,000	12,000
NC 194 - SR 1362 (Perry Road)	4.80	24	60	2	7,300	2,200	4,100	Passing Lanes		
Perry Rd. - NPB	0.74	24	60	2	7,300	50	3,300	See Chapter 2		
NC 194										
WPB - BANNER ELK WCL	0.70	24	60	2	7,200	2,400	5,100			
BANNER ELK WCL - NC 184	0.90	22	60	2	7,200	3,100	10,400			
Beech Mountain Road - NC 184	0.35	20	60	2	7,200	3,600	14,700	E	14,800	14,700
NC 184 - Banner Elk ECL	0.40	20	60	2	7,200	3,600	4,800			
Banner Elk ECL - EPB	1.50	20	60	2	7,200	830	2,000			
SR 1342(HICKORY NUT GAP)										
NC 184 - Lees McRae P.E. Bldg.	0.70	18	40	2	5,600	1,200	1,600			
Lees McRae P.E. Bldg. - SWPB	1.03	18	40	2	5,600	600	1,000			
SR 1337 (DOBBINS ROAD)										
NC 184 - Treetop Lane	2.20	18	60	2	7,000	300	500			
SR 1328 (TUFTS ROAD)										
NC 194 - Dirt Road	0.50	16	N/A	2	5,700	100	100			
SR 1329 (TURNPIKE ROAD)										
NC 184 - Hilldrop Road	0.60	18	60	2	5,700	100	140			
Hilldrop Road - SR 1328	0.70	16	60	2	5,700	100	100			
COLLEGE ROAD										
Banner Road - Pinnacle Way	0.20	24	N/A	2	6,000	200	300			
Pinnacle Way - NC 194	0.40	15	N/A	2		100	100			
BANNER ROAD										
NC 184 - College Road	0.10	26	N/A	2	6,000	100	250			
College Road - NC 194	0.50	26	N/A	2	6,000	100	100			

Appendix B

Thoroughfare Plan Street Tabulation and Recommendation

FACILITY & SECTION	EXISTING CROSS SECTION							RECOMMENDATIONS		
	DIST	RDWY	ROW	NO. OF	PRACTICAL	ADT		RDWY	PRACTICAL	2025
	mi	ft	ft	LANES	CAPACITY	2000	2025	X-SECT	CAPACITY	ADT
HILLDROP ROAD										
SR 1329 (Perkinsviie Drive) - NC 194	0.10	18	N/A	2	1,000	600	1,100			
NC 184 ALTERNATE										
NC 184 - NC 194	1.61							K/ E*	4,000	5,100
EASTSIDE CONNECTOR										
NC 184- NC 194	0.94							K/ E*	3,000	2,500

*Construct 2-lanes on multi-lane right-of-way to allow for future widening.

Appendix C

Typical Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

The recommended typical cross sections shown in Appendix B, Table B-1 were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix B. Recommendations for "ultimate" cross sections are provided for the following:

1. thoroughfares which may require widening after the current planning period
2. thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient
3. thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, super elevation, and other considerations for thoroughfares are given in Appendix D.

A - Four Lanes Divided with Median - Freeway

Typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 46 feet, but a wider median is desirable.

B - Seven Lanes - Curb & Gutter

This cross section is not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes - Curb & Gutter

Typical for major thoroughfares, this cross section is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median - Curb & Gutter/ E - Four Lanes Divided with Raised Median - Curb and Gutter

These cross sections are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The 16 ft median is the minimum recommended for an urban boulevard type cross section. most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians result in greatly increased maintenance costs and an increase danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided - Boulevard, Grass Median

Recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 ft is recommended with 30 ft being desirable.

G - Four Lanes - Curb & Gutter

This cross section is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes - Curb & Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section “H”.

I - Two Lanes - C&G, Parking both sides: J - Two Lanes - C&G, Parking one side

Cross section “I” and “J” are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section “I” would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes - Paved Shoulder

This cross section is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 100 ft should be required. In some instances, local ordinances may not allow the full 100 ft. In those cases, 70 ft should be preserved with the understanding that the full 100 ft will be preserved by use of building setbacks and future street line ordinances.

L - Six Lanes Divided with Grass Median - Freeway

Cross section "L" is typical for controlled access freeways. The 46 ft grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 228 ft depending upon cut and fill requirements.

M - Eight Lanes Divided with Raised Median - Curb & Gutter

Also used for controlled access freeways, this cross section may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lanes/C&G, Widened Curb Lanes; O - Two Lane/Shoulder Section; P - Four Lanes Divided/Raised Median, C&G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

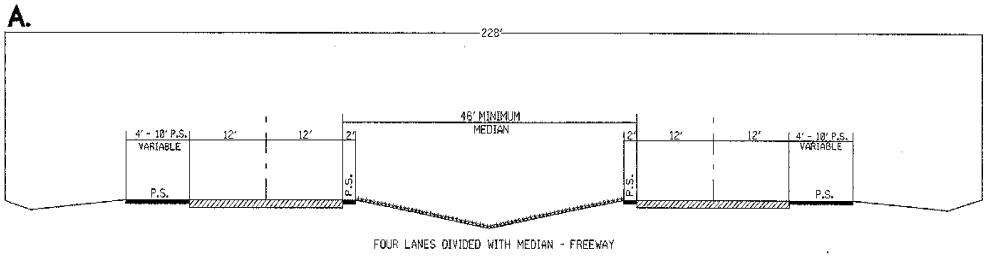
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum right-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

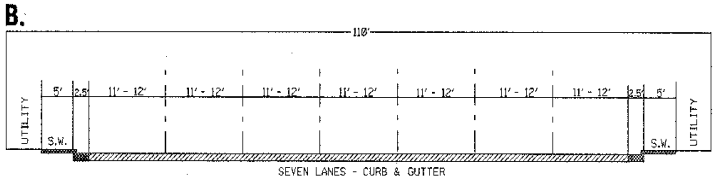
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



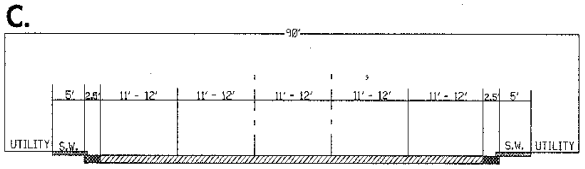
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



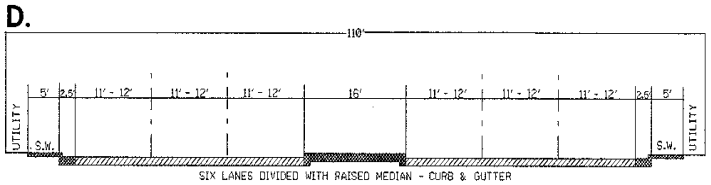
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

D.



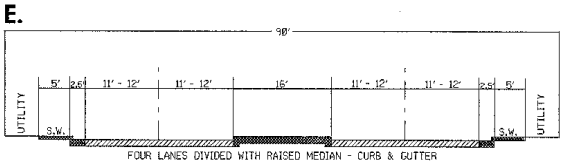
SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

FIGURE C-1

10-1-02

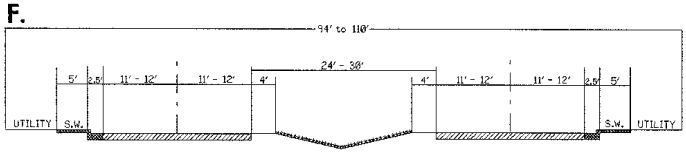
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



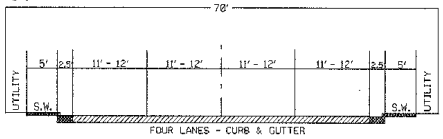
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



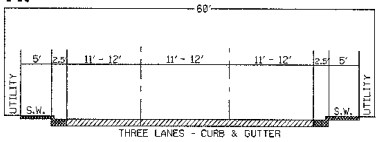
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



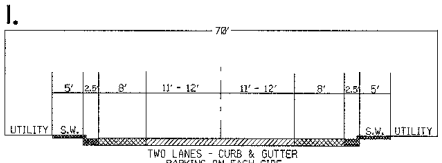
FOUR LANES - CURB & GUTTER

H.



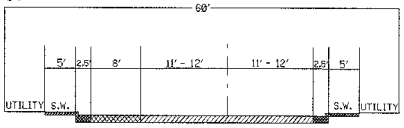
THREE LANES - CURB & GUTTER

I.



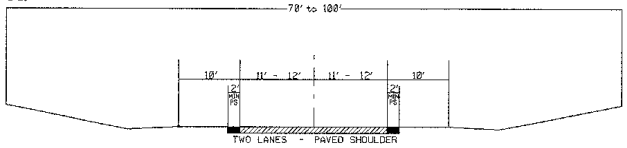
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

K.



TWO LANES - PAVED SHOULDER

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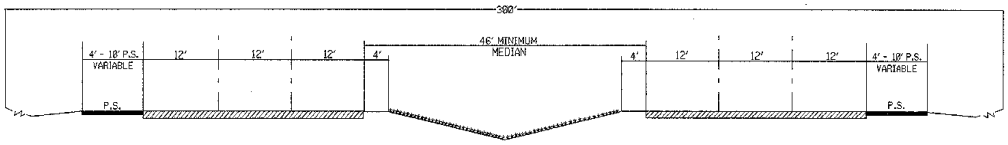
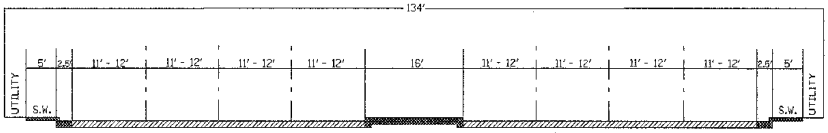
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

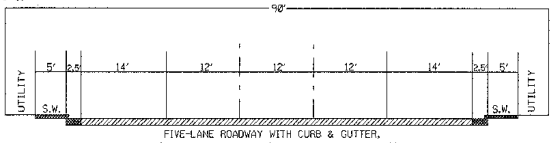
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

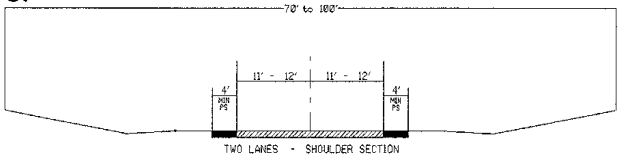
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



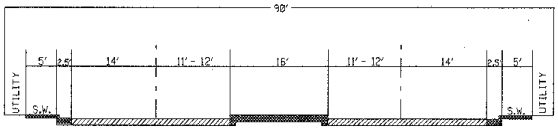
FIVE-LANE ROADWAY WITH CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER,
STANDARD INSIDE LANES & WIDENED CURB LANES

10-1-02

Appendix D
Recommended Subdivision Ordinances

Definitions

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of interstate routes and other routes designated as principal arterials.

2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intrastate and intercounty service at relatively high overall travel speeds with minimum interference to through movement.

3. *Major Collector* - A road which serves major intracounty travel corridors and traffic generators and provides access to the arterial system.

4. *Minor Collector* - A road which provides service to small local communities and traffic generators and provides access to the major collector system.

5. *Local Road* - A road which serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally

with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. *Local Residential Street* - Cul-de-sacs, loop streets less than 2500 feet in length, or streets less than 1.0 miles in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

1. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

2. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

3. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

Subdivision

- Subdivider - Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

- Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

  The following shall not be included within this definition nor subject to these regulations:

  * the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein,
  * the division of land into parcels greater then 10 acres where no street right-of-way dedication is involved,
  * the public acquisition, by purchase, of strips of land for the widening or the opening of streets, and

* the division of a tract in single ownership whose entire area is no greater than 2 acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

- Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

- Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Roadway Design Standards

The design of all roads within a planning area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway & Transportation Officials' (AASHTO) manuals.

The provision of right-of-way for roads shall conform and meet the recommendations of the thoroughfare plan, as adopted by the municipality or county. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally, the proposed streets should be the extension of existing streets if possible.

Right-of-Way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the thoroughfare plan.

The subdivider will only be required to dedicate a maximum of 100 feet of ROW. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. In all cases in which ROW is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width ROW, not less then 60 feet, may be dedicated when adjoining undeveloped property is owned or controlled by the subdivider. This is provided that the width of a partial dedication is such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

Table D-1

Minimum Right-of-way Requirements

Area Classification	Functional Classification	Minimum ROW
RURAL	Principle Arterial	Freeways- 350 ft Other- 200 ft
	Minor Arterial	100 ft
	Major Collector	100 ft
	Minor Collector	80 ft
	Local Road	60 ft[1]
URBAN	Major Thoroughfare	90 ft
	Minor Thoroughfare	70 ft
	Local Street	60 ft [1]
	Cul-de-sac	variable[2]

[1] The desirable minimum ROW is 60 ft. If curb and gutter is provided, 50 ft of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the thoroughfare plan. Width of local roads and streets shall be as follows:

- ***Local Residential***
    * Curb and Gutter section: 26 feet, face to face of curb
    * Shoulder section: 20 feet to edge of pavement, 4 feet for shoulders

- ***Residential Collector***
    * Curb and Gutter section: 34 feet, face to face of curb
    * Shoulder section: 20 feet to edge of pavement, 6 feet for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under the 'Right-of-Way Widths' section shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets are shown in Table D-2.

2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the parameters set forth in Table D-3.

3. *Superelevation* - Table D-4 shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

4. *Maximum and Minimum Grades* - The maximum grades in percent are shown in Table D-5. Minimum grade should not be less then 0.5%. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

Table D-2

Design Speeds

Facility Type	Design Speed (mph) Desirable	Minimum Level	Minimum Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local Roads[1] (ADT Over 400)	50	*50	*40
URBAN			
Major Thoroughfares[2]	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

Note: *Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Table D-3

Sight Distance

Design Speed (mph)	Stopping Sight Distance (feet)		Minimum K[1] Values (feet)		Passing Sight Distance (feet)
	Desirable	Minimum	Crest Curve	Sag Curve	For 2-lanes
30	200	200	30	40	1100
40	325	275	60	60	1500
50	475	400	110	90	1800
60	650	525	190	120	2100

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case. (Reference NCDOT Roadway Design Manual page 1-12 T-1)

[1]K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve, which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table D-4

Superelevation

Design Speed (mph)	Minimum Radius of Maximum e[1]			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

[1] e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table D-5

Maximum Vertical Grade

Facility Type and Design Speed (mph)	Minimum Grade in Percent		
	Flat	Rolling	Mountainous
RURAL			
Minor Collector Roads*			
20	7	10	12
30	7	9	10
40	7	8	10
50	6	7	9
60	5	6	8
70	4	5	6
Local Roads*[1]			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-
URBAN			
Major Thoroughfares[2]			
30	8	9	11
40	7	8	10
50	6	7	9
60	5	6	8
Minor Thoroughfares*			
20	9	12	14
30	9	11	12
40	9	10	12
50	7	8	10
60	6	7	9
70	5	6	7
Local Streets*			
20	-	11	16
30	7	10	14
40	7	9	12
50	6	8	10
60	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 500 ft long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

[1] Local Roads including Residential Collectors and Local Residential.

[2] Major Thoroughfares other than Freeways or Expressways.

Intersections

1.Streets shall be laid out so as to interect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Offset intersections are to be avoided. Intersections that cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than 500 feet in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 20 feet.

3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around as may be required by the planning board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet form the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

The clear roadway widths for new and reconstructed bridges serving two-lane, two-way traffic should be as follows:

- shoulder section approach:
    * under 800 ADT design year - minimum 28 feet width face to face of parapets, rails, or pavement width plus 10 feet, whichever is greater,
    * 800 - 2000 ADT design year - minimum 34 feet width face to face of parapets, rails, or pavement width plus 12 feet, whichever is greater,
    * over 2000 ADT design year - minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails;

- curb and gutter approach:
    * under 800 ADT design year - minimum 24 feet face to face of curbs,
    * over 800 ADT design year - width of approach pavement measured face to face of curbs,
    * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop; the distance from face of curb to face of parapet or rail shall be a minimum of 1.5 feet, or greater if sidewalks are required.

The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

- shoulder section approach - width of approach pavement plus width of usable shoulders on the approach left and right. (shoulder width 8 feet minimum, 10 feet desirable)
- curb and gutter approach - width of approach pavement measured face to face of curbs.

Appendix E

Planning Area Employment and Housing Data

Zone	2000 Employment	2025 Employment	2000 Housing	2025 Housing
1	**20**	**28**	**2**	**3**
2	**92**	**129**	**0**	**0**
3	**49**	**69**	**3**	**5**
4	**16**	**22**	**7**	**11**
5	**566**	**794**	**0**	**0**
6	**13**	**18**	**6**	**9**
7	**8**	**11**	**38**	**59**
8	**8**	**11**	**38**	**59**
9	**32**	**45**	**1**	**2**
10	**8**	**11**	**12**	**19**
11	**8**	**11**	**28**	**43**
12	**5**	**7**	**32**	**50**
13	**2**	**3**	**69**	**107**
14	**99**	**139**	**38**	**59**
15	**2**	**3**	**6**	**9**
16	**6**	**8**	**12**	**19**
17	**11**	**15**	**20**	**31**
18	**8**	**11**	**200**	**311**
19	**0**	**0**	**20**	**31**
20	**134**	**188**	**113**	**175**
21	**193**	**271**	**44**	**68**
22	**26**	**36**	**339**	**526**
23	**72**	**101**	**41**	**64**
24	**0**	**0**	**40**	**62**
25	**0**	**0**	**16**	**25**
26	**0**	**0**	**10**	**16**
27	**0**	**0**	**49**	**76**
28	**102**	**143**	**40**	**62**
29	**1**	**1**	**8**	**12**
30	**0**	**0**	**1**	**2**
31	**7**	**10**	**25**	**39**
32	**7**	**10**	**44**	**68**
33	**19**	**27**	**26**	**40**
34	**2**	**3**	**10**	**16**
35	**36**	**50**	**19**	**30**

Appendix F

Pedestrian Policy Guidelines

Executive Summary

These guidelines provide a procedure for implementing the Pedestrian Policy adopted by the Board of Transportation in August 1993. The pedestrian Policy addresses TIP projects and makes an important distinction between "considering the needs of pedestrians to avoid creating hazards to pedestrian movements" and the concept of "facilitating pedestrian movements for other reasons."

Hazards

A hazard in this context is defined as a situation when pedestrian movements are physically blocked in a manner which forces pedestrians to use another mode of transportation or walk in an automobile traffic lane (parallel with the automobile traffic) to pass a barrier. The concept of "not creating a hazard" is intended to allow municipalities to have the flexibility to add pedestrian facilities as part of the project, or in the future after the TIP project is complete. Our current standard cross sections generally do not create barriers for pedestrian movements. One exception is on urban bridges where the bridge rail is at the back of the curb.

Quantifying the need for Pedestrian Facilities

Planning studies should evaluate the need for pedestrian facilities based on the degree to which the following criteria are met.

1. Local Pedestrian Policy
2. Local Government Commitment
3. Continuity and Integration
4. Locations
5. Generators
6. Safety
7. Existing or Projected Pedestrian Traffic

Requirements for DOT Funding

Replacing Existing Sidewalks

The DOT will pay 100% of the cost to replace an existing sidewalk which is removed to make room for a widening project.

Preventing Hazards

If there is evidence that a TIP project would create a hazard to existing pedestrian movements, the DOT will take the initiative to not create the hazard. However, if there is not evidence that a TIP project would create a hazard to existing pedestrian movements, the municipality will need to prove there will be pedestrian movements which will be affected within five years by the hazard created by the TIP project.

Incidental Projects

Due to the technical difficulty of describing justification for pedestrian facilities, the committee chose a cost sharing approach to provide cost containment for the pedestrian facilities. The DOT may share the incremental cost of constructing the pedestrian facilities if the "intent of the criteria" are met. The DOT will pay a matching share of incidental pedestrian facility total construction costs up to a cap of no more than 2% of total project construction cost. The matching share is a sliding scale based on population as follows:

Table F-1

Incidental Projects Cost Participation Break Down

Municipal Population	Participation	
	DOT	Local
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
< 10,000	80%	20%

Funding Caps

Under normal circumstances, the cumulative funding for preventing hazards and providing incidental pedestrian facilities should not exceed 2% of the total project construction cost.

Independent Projects

The DOT will have a separate category of money for all independent pedestrian facility projects in North Carolina. The independent pedestrian facility funds will be administered similar to the Bicycle Program.

Right-of-Way

In general, municipalities are responsible for providing any right-of-way needed to construct pedestrian facilities. However, the 8 foot berm the DOT generally provides on urban curb and gutter facilities can accommodate pedestrian facilities.

Maintenance

Local governments will be responsible for maintaining all pedestrian facilities.

For further information about the Pedestrian Policy Guidelines please contact the following:

Statewide Planning Branch
NC Department of Transportation
1554 Mail Service Center
Raleigh, NC 27699-1554
(919) 733-4705

Appendix G

Transportation Improvement Program (TIP) Project Process

The process for attempting to get a project into the TIP is described briefly in this appendix.

The city council should first decide on which projects from the thoroughfare plan they would like funded and placed in the TIP book. They should not try and attempt to get all of the improvements recommended in the thoroughfare plan into the TIP but select carefully a few of the projects that would provide the greatest impact on the traffic network in the area. These projects should be prioritized by the city council and summarized briefly, as shown on Appendix Page G-3.

After determining which projects are needed in the area then an official letter for the TIP Project Request should be written to the N.C. Board of Transportation Member from the municipality's or county's respective district. Along with the letter, should be the prioritized summary of proposed projects for funding, a TIP Candidate Project Request Form for every project that is to be considered for funding and inclusion for funding. An example of each one of these items is included in this appendix on the pages that follow.

Example

**Note: This is not the official request the City of Oxford submitted to the Board of Transportation. This was done by the Statewide Planning Branch to be an example for what should be enclosed for the Transportation Improvement Program (TIP) Request.*

December 8, 1997

North Carolina Board Member
N.C. Board of Transportation
N.C. Department of Transportation
P.O. Box 25201
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 1998-2004 TIP Project Requests for the City of Oxford

Enclosed find the projects requested by the City of Oxford for consideration in the next TIP update. The list is presented by priority, as approved by the Oxford City Council at their November meeting.

The City of Oxford also endorsed the existing schedule of projects contained in the current TIP for the Oxford Urban Area, with one request. The City of Oxford requests that TIP project #X-XXXX remain as a high priority and keep on the existing schedule.

We thank you for the opportunity to participate in development of the State TIP. Please contact us immediately if addition information is needed concerning any of the enclosed project requests.

Sincerely,

John Q. Public

cc: Division Engineer
Enclosure

City of Oxford
City Council

1997 Proposed Highway Projects (Sample)

SR 1195 & SR 1646 (Industry Drive) TIP Project #U-3322
-From SR 1166 (Hillsboro Street) to NC 96 (Linden Avenue) widen roadway to a multilane facility, with some new location.

US 15
-From SR 1646 (Industry Drive) to SR 1134 (Shady Grove Road)
-Widen roadway to a multilane facility.

NC 96
-From SR 1609 (Harris Road) to the existing four lane section just south of I-85.
-Widen roadway to a multilane facility.

US 158 Business (Williamsboro Road)
-From SR 1522 (Salem Road) to US 158 (Oxford Outer Loop).
-Widen facility to a five lane cross section.

New Connector
-From US 15 (College Street) to US 158 Business (Williamsboro Street).
-New Facility.

US 15
-From US 158 (Oxford Outer Loop) to SR 1423 (Carrington Road).
-Widen facility to a multilane facility.

NC 96
-From US 158 (Oxford Outer Loop) to SR 1422 (Watkins-Wilkinson Road).
-Widen roadway to a multilane facility.

US 158 (Oxford Outer Loop) TIP Project #R-2257
-From Oxford western planning boundary to the eastern planning boundary.
-Widen roadway to a multilane facility.

Highway Program
TIP Candidate Project Request

(Please Provide Information if Available)

Date 03/05/04 Priority No. 1

County Granville City/Town Oxford

Requesting Agency City of Oxford NCTIP No. U-3322 (if available)

Route (US, NC, SR/Local Name) SR 1195 and SR 1646 (Industry Drive)

Project Location (From/To/Length) From SR 1166 (Hillsboro Street) to NC 96 (Linden Avenue). 2.3 miles (3.7 km)

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)
Widen roadway to a multi-lane facility, with some new location.

Existing Cross Section 24 Feet, Type

Existing Row 60 to 80 Feet Existing ADT 8,800 (1995)

Estimated Cost, ROW $ 900,000 Construction $ 4,000,000

Brief Justification for Project Major Thoroughfare, This facility carries increasing traffic volumes between the industial sites along this route to NC 96 and the I-85 corridor.
In the adopted thoroughfare plan for Oxford it is recommended that this facility should be widen to a five lane cross section due to the increasing volume and the potential for more development in this area. The city request that this project continue to be funded.

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Thoroughfare Plan
- ☐ Part of Comprehensive Plan
- ☐ Serves School
- ☐ Serves Hospital
- ☐ Obsolete Facility
- ☐ Serves Park
- ☐ High Accident (#)
- ☐

Appendix H
Resources and Contacts

North Carolina Department of Transportation

Customer Service Office
1-877-DOT4YOU
(1-877-368-4968)

Secretary of Transportation
1501 Mail Service Center
Raleigh, NC 27699-1501
(919) 733-2520

Board of Transportation Member
Current contact information for the Board of Transportation may be accessed from the NCDOT homepage (http://www.dot.state.nc.us/board)
Or by calling the Customer Service Office.

Highway Division
Division specific contact information can be found at
http://apps01.dot.state.nc.us/apps/directory/toc.html

Division Engineer
Contact the Division Engineer with general questions concerning NCDOT activities within each Division; information on Small Urban Funds.

Division Construction Engineer
Contact the Division Construction Engineer for information concerning major roadway improvements under construction.

Division Traffic Engineer
Contact the Division Traffic Engineer for information concerning high- collision locations.

District Engineer
Contact the District Engineer for information regarding Driveway Permits, Right of Way, Encroachments, and Development Reviews.

County Maintenance Engineer

Contact the County Maintenance Engineer regarding any maintenance activities, such as drainage.

Centralized Personnel

Statewide Planning Branch

Contact the Statewide Planning Branch with long-range planning questions.
1554 Mail Service Center
Raleigh, NC 27699-1554
(919) 733-4705

Secondary Roads Office

Contact the Secondary Roads Office for information regarding the Industrial Access Funds Program.
P.O. Box 25201
Raleigh, NC 27699
(919) 733-2039

Program Development Branch

Contact the Program Development Branch for information concerning Roadway Official Corridor Maps and the Transportation Improvement Program (TIP)
1534 Mail Service Center
Raleigh, NC 27699-1534
(919)733-2039

Project Development & Environmental Branch

Contact PDEA for information on environmental studies for projects that are included in the TIP.
1548 Mail Service Center
Raleigh, NC 27699-1548
(919) 733-3141

Highway Design Branch

Contact the Highway Design Branch for information regarding alignment for projects that are included in the TIP.
1584 Mail Service Center
Raleigh, NC 27699-1584
(919) 250-4001

Public Transportation Division

Contact the Public Transportation Division for information public transit systems.
1550 Mail Service Center
Raleigh, NC 27699-1550
(919) 733-4713

Other Departments

Contact information for other departments within the NCDOT not listed here are available at the NCDOT homepage at http://apps01.dot.state.nc.us/apps/directory/toc.html or by calling the Customer Service Office.

Other State Government Offices

Division of Community Assistance

Contact the Division of Community Assistance for information regarding the Community Planning Program. You may find their contact information at *http://www.dca.commerce.state.nc.us*